THE WEATHER AND CIRCULATION OF APRIL 1958[1]

PAUL STARK

Extended Forecast Section U. S. Weather Bureau, Washington, D. C.

1. INTRODUCTORY REMARKS

Not since November 1957 has there been a monthly mean trough in the United States west of the Mississippi River, although in March 1958 a trough of moderate intensity was located along the west coast (fig. 4 of [1]). During April (fig. 1) that trough moved inland, perhaps as a result of the downstream dispersion of vorticity following the generation of increased westerlies and a new trough in the Pacific at middle latitudes. The increase in zonal winds in the Pacific followed the development of an Asiatic coastal trough in March, a feature conspicuously absent during the months of January and February 1958 [2, 3].

In April, on the average, there were remnants of blocking over northeastern Canada, but the complete collapse of that blocking near the end of the month and its replacement by a mean trough permitted a northerly displacement of mid-latitude westerlies. Retreat of Canadian blocking toward the west and entry of the west coast trough into the United States were responsible for considerable variability in weather and circulation patterns, not only from week to week but also on a bi-weekly basis. Many daily, monthly, and seasonal records of temperature and precipitation were broken, some of which are listed in table 1.

2. MONTHLY MEAN CIRCULATION AND WEATHER

INDEX

The monthly mean circulation for April, shown in figure 1, represents a transition stage over North America from a low index state to one of a higher index. Of course, that is not apparent solely from the 700-mb. contours. One can see that there was a general zonal flow in the temperate westerlies of the Western Hemisphere, with the exception of the interruptions in the Gulf of Alaska and northwestern Canada. However, the departure from normal isopleths (hereafter called DN), shown as dotted lines in figure 1, give a more graphic representation of the state of the zonal westerlies. In this instance there was actually an easterly flow relative to normal north of 45° N. over most of North America. Thus, in spite of the apparently well-formed westerlies, there were some low index features, especially blocking, which persisted long enough to retain their identities and affect the month-long time-averaged mean.

[1] See Charts I-XVII following p. 148 for analyzed climatological data for the month.

TABLE 1.—*April monthly weather records broken in 1958*

Station	Record
Precipitation	
Alpena, Mich	Driest of record.
Greenville, S. C	Wettest of record.
Jacksonville, Fla	Do.
Mt. Shasta, Calif	Greatest snowfall in 80 years.
Newark, N. J	Wettest of record.
Providence, R. I	Do.
San Francisco, Calif	Wettest since 1884.
Worcester, Mass	Wettest of record.
Temperature	
Cape Hatteras, N. C	Coldest since 1907.
Ely, Nev	Coldest of record.
Los Angeles, Calif	Warmest of record.

The computed zonal index for temperate westerlies (35° N.—55° N. in the Western Hemisphere) for April was 7.9 m. p. s., only 0.4 m. p. s. below normal. But that represents a considerable recovery over the previous month whose index was 5.3 m. p. s., some 3.8 m. p. s. below normal. The rise of index in April is even more significant if one considers that the index normally decreases by 0.8 m. p. s. from March to April.

NORTHERN HEMISPHERE CIRCULATION

While our interest is centered principally on North America, it is worthwhile to examine the salient features of the general circulation of the whole Northern Hemisphere. In figure 1 there are three major troughs at high latitudes and six significant middle-to-low-latitude troughs. That wave number was supported to some extent by the existence of high-latitude blocking, which can be seen as positive DN centers over Alaska, northern Quebec, and the Norwegian Sea.

The outstanding feature of the DN pattern was the overall weakness of the gradient, except for the area from Scandinavia to northwestern Siberia, and another just east of Japan. In the latter region the abnormal strength of the subtropical ridge, which was longitudinally in phase with a deep polar trough, accounted for the fairly strong westerlies sweeping across the north-central Pacific. The DN gradient over the United States was especially weak and is not indicative of the variability within the month.

The subtropical ridging in the eastern Pacific was accompanied by a difluent area along the United States west coast, to the rear of the progressive trough in the central United States. The difluence was partially re-

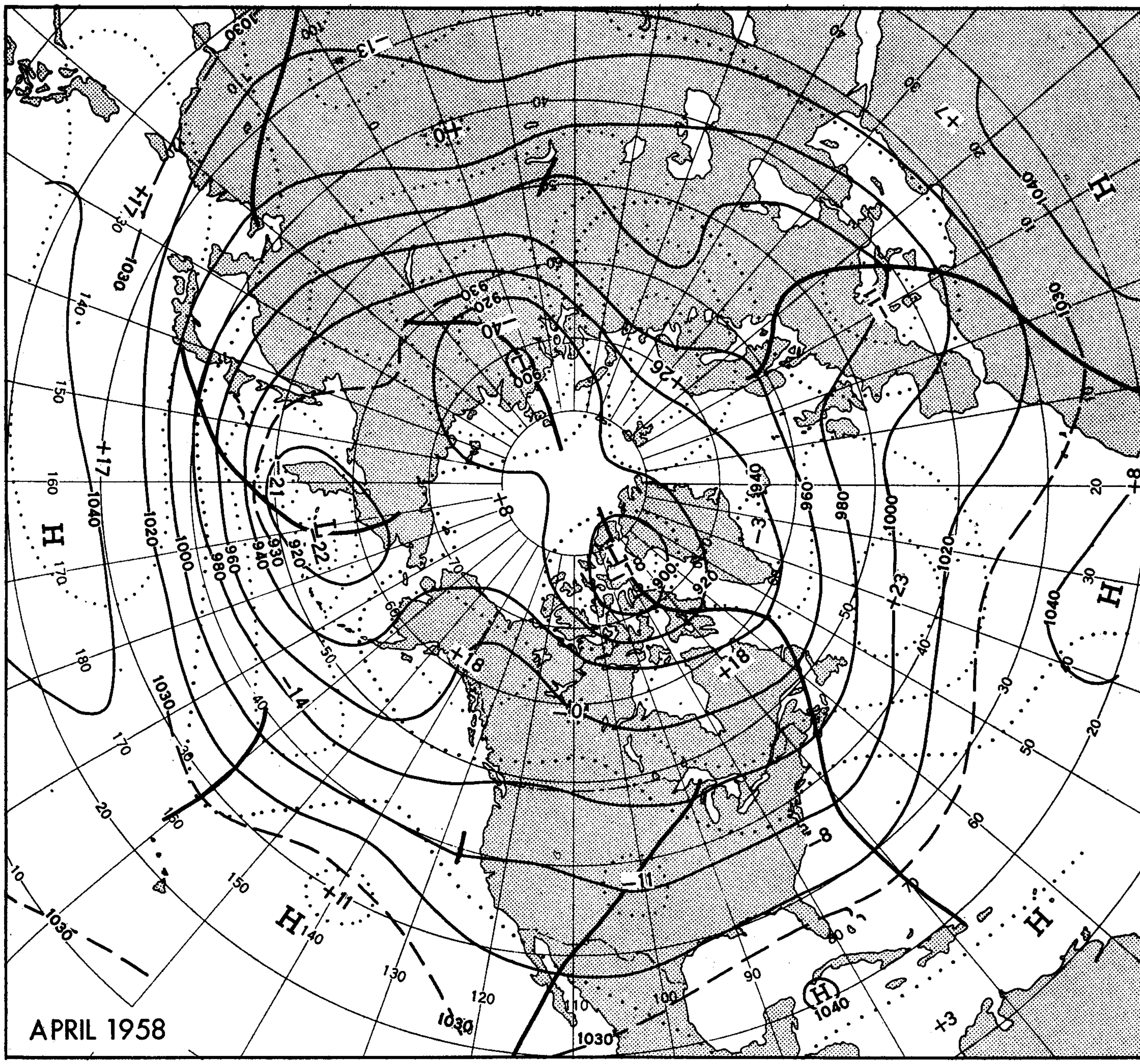


FIGURE 1.—Mean 700-mb. contours (solid) and height departures from normal (dotted) (both in tens of feet) for April 1958. High-latitude blocking over North America is defined by the positive height departures in the north and negative height departures to the south.

sponsible for lower than normal 700-mb. westerly wind speeds across the northern United States. The slight ridge in the eastern United States and the residual block in Quebec also contributed to the weaker than normal westerlies.

Most of North America was under the influence of cyclonic flow at the 700-mb. level as can be seen in figure 1, with Canada having a flow much more cyclonic than that in the United States. The short wave-spacing between the two United States troughs along 45° N. might have been incompatible had it not been supported by the block in Quebec.

The Atlantic was characterized by the normally sharp slope (vertically) of the Icelandic Low [4] and the presence of a strong ridge in the eastern portion. The DN field shows that there must have been some tendency toward bridging between the Canadian block and the intensifying Atlantic ridge. The European-African trough is normally sheared [4] with the middle-to-low-latitude segment west of Spain and Africa. Its position far inland this month, however, was favored by the building of the Atlantic ridge and the Scandinavian block.

To a great extent Asia was dominated by the deepening Low in north-central Siberia and its rather extensive DN

468423—58——2

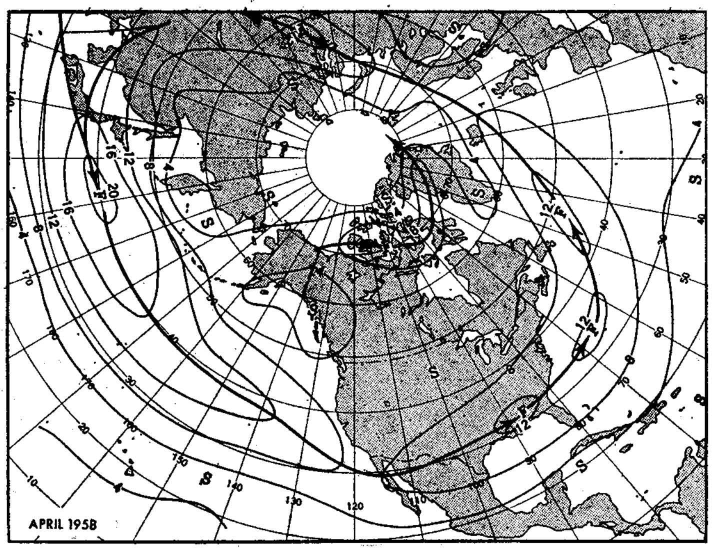


FIGURE 2.—Mean 700-mb. isotachs for April 1958 in meters per second. Solid arrows represent the mean 700-mb. jet stream which was located far to the south. Centers of fast and slow wind speed are located by F and S.

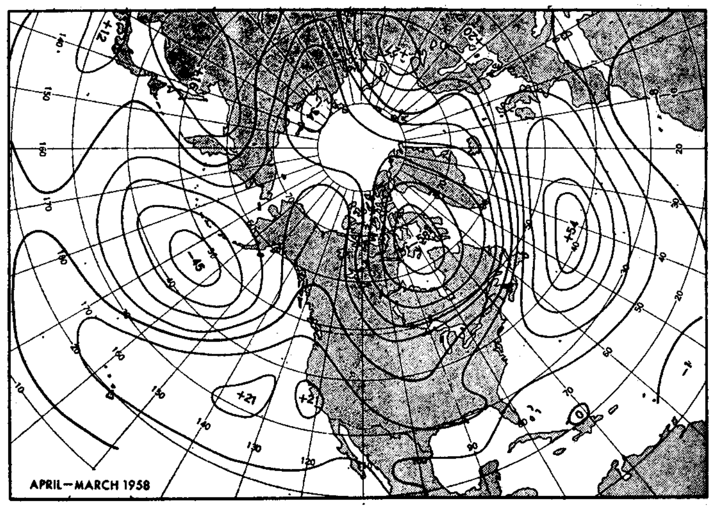


FIGURE 3.—Change of 700-mb. mean height departures from normal from March to April 1958. Labels of centers are in tens of feet. Note increased westerly flow in most of the Western Hemisphere at middle latitudes.

field. The motion of that Low, some 15° of longitude eastward from the previous month, may have repelled the next Low and trough downstream, which moved a like distance from March to April.

Most of the features discussed above are further illustrated in figure 2, the monthly mean 700-mb. isotachs. Note especially the split of the jet stream into high- and low-latitude branches in those areas where blocking predominated.

UNITED STATES WEATHER

The departure from normal of average temperature in the United States for April, shown in Chart I–B, reveals a broad band of below normal temperatures from the Pacific Northwest to the Rio Grande and Tennessee Valleys. Except for Nevada and the Texas Panhandle, the magnitude of the departures was quite small, which is consistent with the rather flat negative DN field shown in figure 1. The normal to above normal temperatures from eastern Montana to the Middle Atlantic States resulted from the persistent Canadian blocking (and resultant easterly DN flow) and above normal 700-mb. heights which extended from the Northern Plains States eastward. A further factor to consider is that the tracks of polar anticyclones (Chart IX) were principally north of the Canadian border.

The above normal temperatures observed in the California coastal belt cannot be explained in terms of DN flow. In fact, an onshore DN and contour flow would usually produce cooler than normal temperatures. However, cold air inland and its suppressing effect on the sea breeze usually does produce some warming along the coast. But since warmer than normal temperatures have been extremely persistent in this area, there may be other factors contributing to this complex subject, such as the warmer than normal sea surface temperatures reported off California for the past several months.

April was a rather wet month in many areas of the United States. (See Charts II and III–B.) At least half of the country received greater than normal amounts of precipitation, with many areas exceeding more than one and one-half times normal. Several stations reported record April rains (table 1), and heavy snow fell in parts of the Sierra Nevada mountains, Utah, New Mexico, and Montana. Only one station reported a record dry month.

In terms of the circulation, the heavy precipitation west of the Continental Divide fell with the advance inland of the west coast trough. The heavy precipitation from Texas eastward and northeastward closely paralleled the axis of low pressure seen on the mean sea level chart for April (Chart XI). Also associated with that band of heavy rainfall were the displacement of the 700-mb. jet stream far to the south (fig. 2) and the location of a secondary maximum of cyclone frequencies (shown only as tracks in Chart X) in the Gulf of Mexico, where cyclone frequency is normally low during April [5].

The area of below normal precipitation from southern Utah to Missouri is difficult to explain. Most qualitative considerations indicate the probability of heavy precipitation in that area, but a survey of daily sea level charts shows that there was considerable northerly flow which would have been discouraging to heavy precipitation. The mean southerly flow at sea level on Chart XI appears to have been too weak to permit the establishment of a pronounced moist tongue of Gulf air that far to the north. This and other features mentioned above may have more meaning after a discussion of the changes in circulation which took place from March to April.

3. MARCH TO APRIL CHANGES IN CIRCULATION AND WEATHER

CIRCULATION

Principal circulation changes from March to April can best be interpreted from figure 3, the 30-day mean 700-mb. anomalous height change from March to April. (The reader is referred to figure 4 of the preceding report of this series [1] for the March contour pattern.)

Excepting Asia, the overall decrease in DN at high latitudes, combined with the increased DN at middle and low latitudes, indicates: (1) a general increase in westerly winds (a rising index), and (2) a weakening of the blocking in the Western Hemisphere.

Blocking on the Asiatic side of the Pole in the Laptev Sea was transferred to the south of Novaya Zemlya in April, where a 270-foot positive anomalous change was centered. The increases over Manchuria were possibly a response to the upstream deepening of the mean Low over north-central Siberia.

Large height changes occurred in the Pacific from March to April. A ridge in March, extending from the Gulf of Alaska to Midway Island, was replaced in April by a flattening of the westerlies and cyclonic curvature. An extensive increase in DN in the eastern Pacific resulted. Consequently, the west coast trough of March was forced inland to the west-central United States where we see a decrease of DN extending northward to a 580-foot maximum change over Hudson Bay. This does not mean that blocking left that part of Canada completely, but it must have been eroded substantially.

In the Atlantic and western Europe the increased DN indicates that there was a great growth of the subtropical ridge. This, in turn, was associated with weakening and retrograde motion of the western Atlantic trough to the west of Greenland and along the United States east coast. Thus it became a part of the North American trough-ridge complex and consequently a factor in United States weather.

WEATHER

Changes in weather over the United States from March to April are most easily expressed in terms of temperature and precipitation classes. The reports from one hundred selected stations used routinely are summarized in table 2 in terms of class changes. (For example: a class change of +2 in temperature means that a particular station may have warmed in the mean from normal to much above or from much below to normal.) Table 2 shows that April was considerably warmer than March. Only 7 percent of the country had lower anomalous temperatures during April, while 55 percent of the stations were warmer than in March. The remaining 38 percent showed no change.

TABLE 2.—*Temperature and precipitation class changes from March to April 1958 in the United States (based on 100 selected stations).*

Temperature		Precipitation	
Class change	Percent of stations	Class change	Percent of stations
+3	2	+2	12
+2	20	+1	23
+1	33	0	44
0	38	−1	16
−1	7	−2	5
−2	0		
−3	0		

The class changes of precipitation from March to April, expressed in terms of three classes in table 2, show that April was somewhat wetter than March. Forty-five percent of the cities showed an increase of one or two classes, while 21 percent totaled less precipitation than in March.

The changes in circulation and weather described above did not proceed in a gradual manner during April. It is true that if one is given monthly mean charts at sea level and aloft, certain qualitative comments and deductions can be made. However, there was considerable variability during April, and therefore, many of the weather details can be more easily recognized and discussed by use of shorter-period time-means.

4. VARIABILITY WITHIN THE MONTH IN AND NEAR NORTH AMERICA

APRIL 1–15

The 700-mb. circulation for the first 15 days of April shown in figure 4a presents a picture of blocking over North America. The split in the westerlies approaching the continent not only provided for two storm tracks, but also left between the two belts an area of shattered trough and blocking ridge.

The anomalous temperatures for the United States are shown in figure 5a. Here we see a pattern which is not atypical of a blocking regime and which compares well with the DN flow in figure 4a. The DN flow derived from the blocking was easterly across the northern States, with heights above normal from North Dakota through the northern Great Lakes. Even though some of the heights were slightly below normal, that type of flow encourages warmer than normal temperatures since in April the cold source region is not in eastern but in western Canada.

The below normal temperatures in the southern two-thirds of the United States resulted almost exclusively from intrusions of relatively cold Pacific air in a moderately fast, low-latitude, carrying current along the mean jet axis (fig. 2). There were only two penetrations of continental polar air into the country in this period, and those were of short duration. (See Chart IX.) Most of the polar anticyclonic activity was concentrated in the Hudson Bay area, where Highs are frequent in April [5], and where they became the sea level counterpart of upper-level blocking.

A comparison of the 2 weeks comprising the first half of April [2] brings out some interesting occurrences. An

[2] It is not implied that the two 5-day means will total the 15-day mean shown. For convenience and economy of space only 4b and 4c were selected as representative of the first and second weeks of the month.

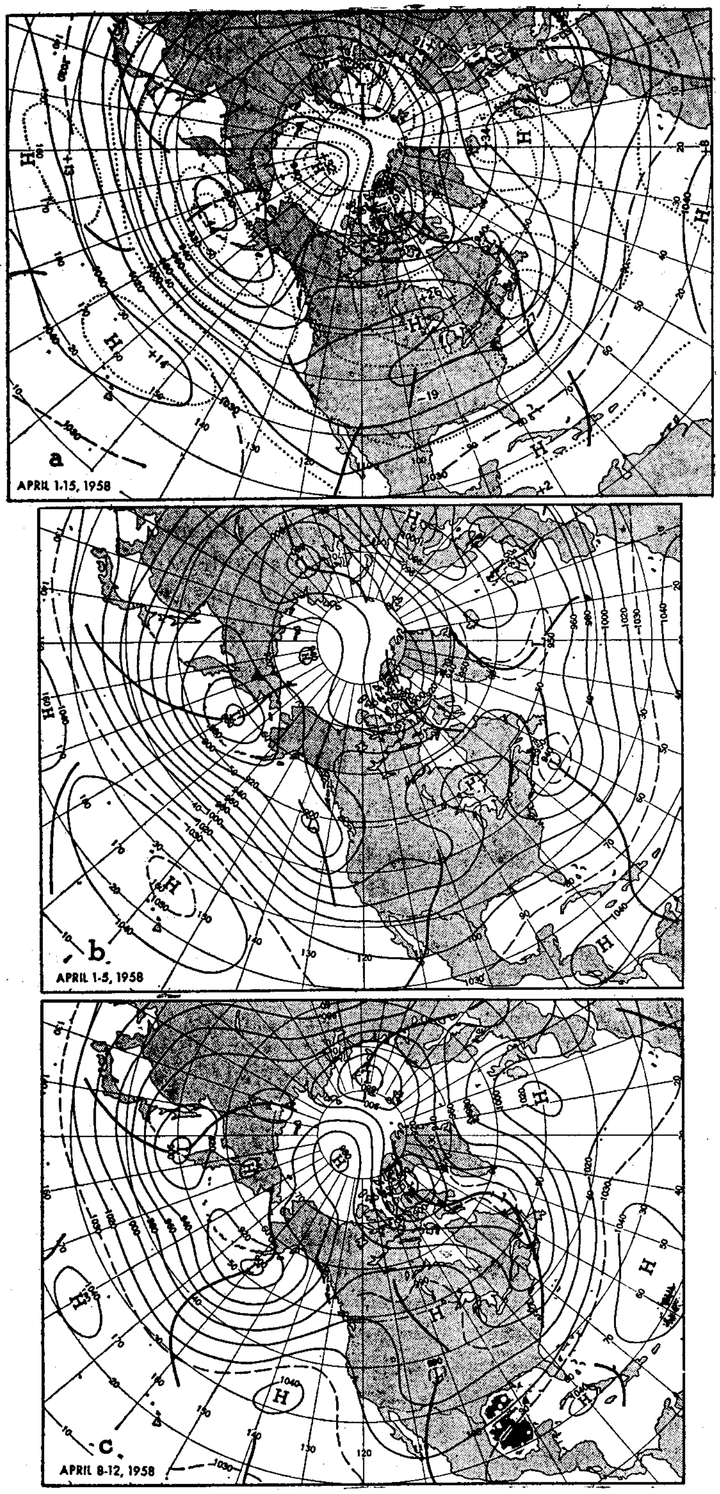


FIGURE 4.—(a) 15-day mean 700-mb. contours (solid) and height departures from normal (dotted) (both in tens of feet) for April 1–15, 1958. The blocking ridge in Canada is apparent from both 700-mb. contours and height departures, but on the monthly 700-mb. chart (fig. 1) only height departures showed the blocking. (b) 5-day mean 700-mb. contours (tens of feet) for April 1–5, 1958, representative of the week ending April 6. Note blocking High north of Lake Huron and shearing of United States west coast trough. (c) 5-day mean 700-mb. contours (tens of feet) for April 8–12, 1958, representative of week ending April 13. Well-defined southwestern trough occurred with retrogression of blocking and simultaneous growth of ridge into the Pacific Northwest.

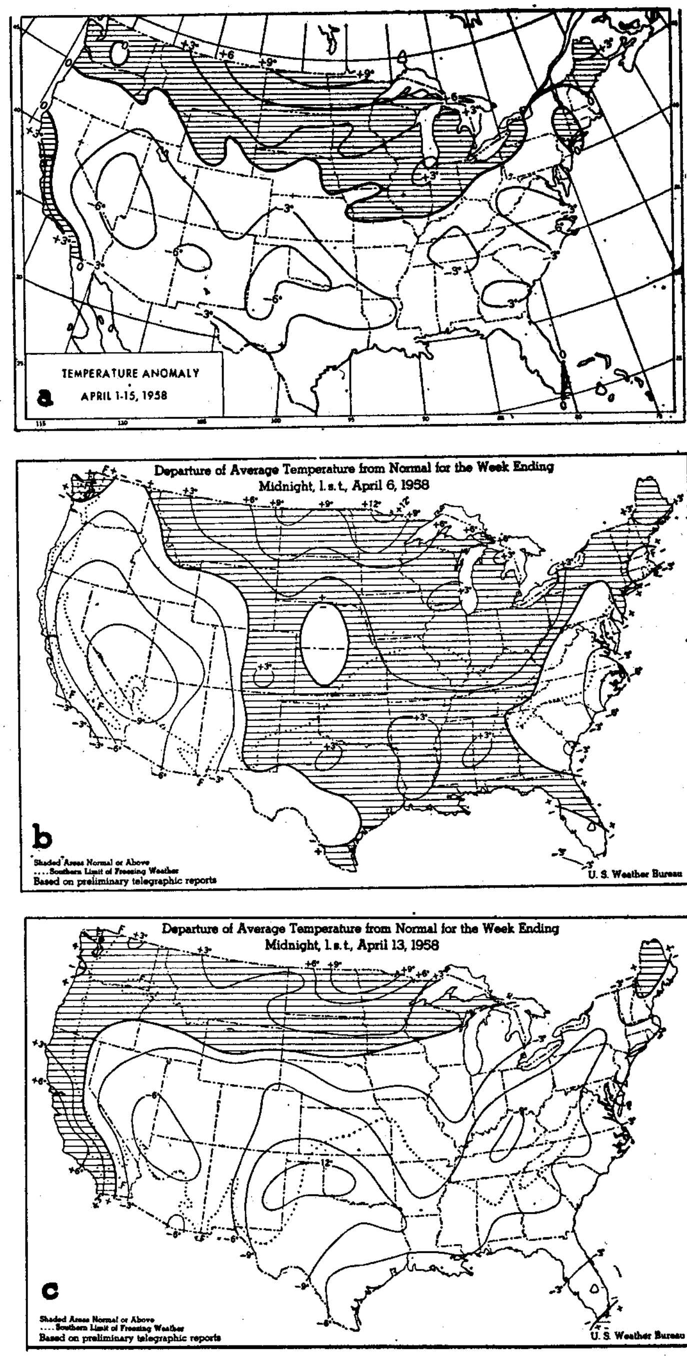


FIGURE 5.—Departure of average surface temperatures from normal (F. °) during the first half of April 1958. (a) April 1–15. This type of zonal pattern, warm in the north and cold in the south, represents the influence of blocking. (b) Week ending April 6. Cold air covered the West, but the central half of the country was warm as the west coast trough sheared and moved inland. (c) Week ending April 13. Cold air progressed to the east coast through the trough, and the west coast warmed as the 700-mb. ridge extended into the Pacific Northwest. (b and c from *Weekly Weather and Crop Bulletin, National Summary,* vol. XLV, Nos. 14 and 15, April 7 and 14, 1958.)

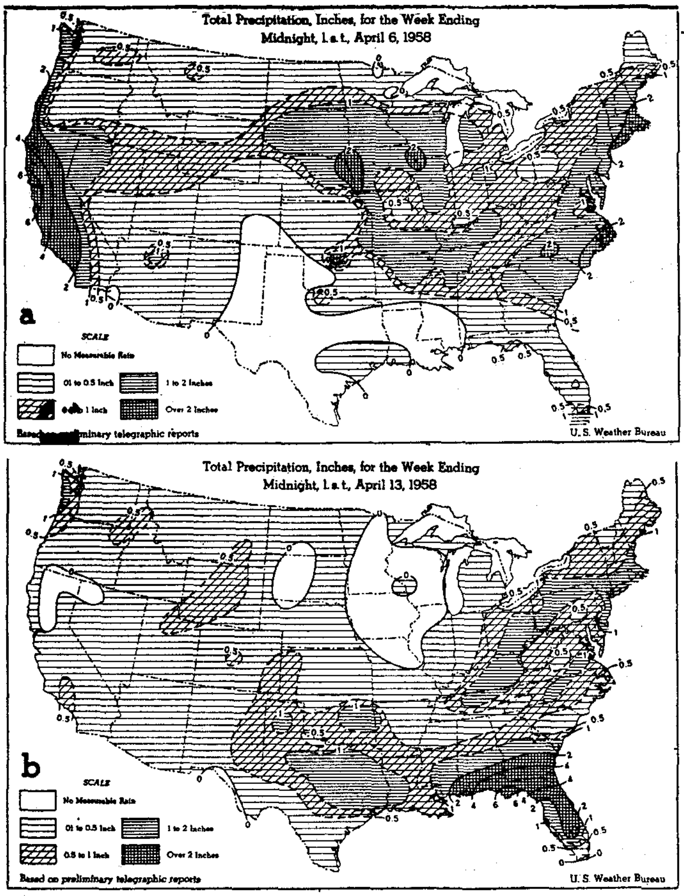


FIGURE 6.—Total precipitation, inches, for: (a) April 1–6, 1958. Amounts over 6 inches in the San Francisco region caused local flooding before the trough moved inland. (b) April 8–13, 1958. Northerly 5-day mean 700-mb. flow over the West inhibited rainfall as the trough moved inland. Cyclogenesis in the Gulf of Mexico early in the week was responsible for the heavy accumulation in the Southeast. (From *Weekly Weather and Crop Bulletin, National Summary*, vol. XLV, Nos. 14 and 15, April 7 and 14, 1958.)

inspection of figure 4b reveals a blocking High between James Bay and Lake Superior, in phase with a tropical ridge in the eastern Gulf States. The northern portion of the west coast trough stayed well offshore, while that segment below 40° N. sheared and moved rapidly inland.

Successive invasions of fairly cold maritime Pacific air-masses followed, and most of the West became much colder than normal, with temperatures averaging more than 9 F.° below normal over southern Nevada (fig. 5b). Meanwhile, the balance of the country was normal or above, except for below normal temperatures in the East which lagged the offshore trough.

Precipitation (fig. 6a) was most notable in California. Record amounts (table 1) accumulating in this first week of the month were accompanied by severe local flooding and mudslides and heavy snows in the mountains [6]. Only light amounts of rain fell near the trough in the southern Plains owing to the foehn drying effect and the absence of Gulf moisture.

The second week of April was quite different from the first. The remnants of the offshore west coast trough were replaced by strong ridging (fig. 4c) into the Pacific Northwest as the blocking High retrograded to North Dakota. Thus, as the western trough-ridge couplet became appreciably more meridional, a temperature reversal took place in the second week (fig. 5c).

As rapid cooling spread eastward from the Southwest, above normal temperatures in the South and Central States dropped to below normal. Temperatures as much as 14 F.° below normal were reported in the Texas Panhandle, a change of some 15F.° in the mean in a week's time. In the Pacific Coast States temperatures were above normal under the ridging aloft.

Precipitation in the West was generally less than one-half an inch (fig. 6b), with an inhibiting northerly flow aloft to the rear of the Southwest trough. As westerlies with broad cyclonic curvature swept over the Gulf States, rainfall amounts exceeding 7 inches were deposited in Florida with the development of two Gulf storms. (See Chart X.)

In general, then, as the week progressed, precipitation was most marked in the eastern and southern parts of the country, and average temperature anomalies assumed a zonal nature with warm air to the north and cold air to the south. Sudden changes followed, however, to give a sharply different picture of those elements.

APRIL 16–30

Changes in 700-mb. circulation during the last half of April were quite abrupt. Even a cursory comparison of the last 15 days of April (fig. 7a) with the first 15 days (fig. 4a) shows certain obvious gross differences in and near North America.

The amplification in the eastern Pacific was perhaps the most important areal change in the Western Hemisphere. In the Gulf of Alaska there were rises of some 800 feet from the previous 15-day period. That imposing block was probably related to the suppression of the High in the Arctic Ocean and the discontinuous retrogression of the Canadian block. Regardless of its evolution, however, its effect downstream was of great importance. One result was the consolidation of the multiple trough structure in the western United States of the first half of the month to an almost full-latitude trough in the central United States during the following 15 days. The change was reflected somewhat in the DN distribution (fig. 7a), but much more so in the changes in anomalous temperatures.

Temperature departures from normal for the last half of the month (fig. 8a) hardly resemble those of the first half of April. Significant warming in the Southwest and East, coupled with vigorous cooling in the Northwest, produced a pattern of anomalies which was dominantly meridional, in contrast to the zonal pattern of April 1–15.

The blocking ridge in the Gulf of Alaska and the accompanying northerly DN flow over western North America

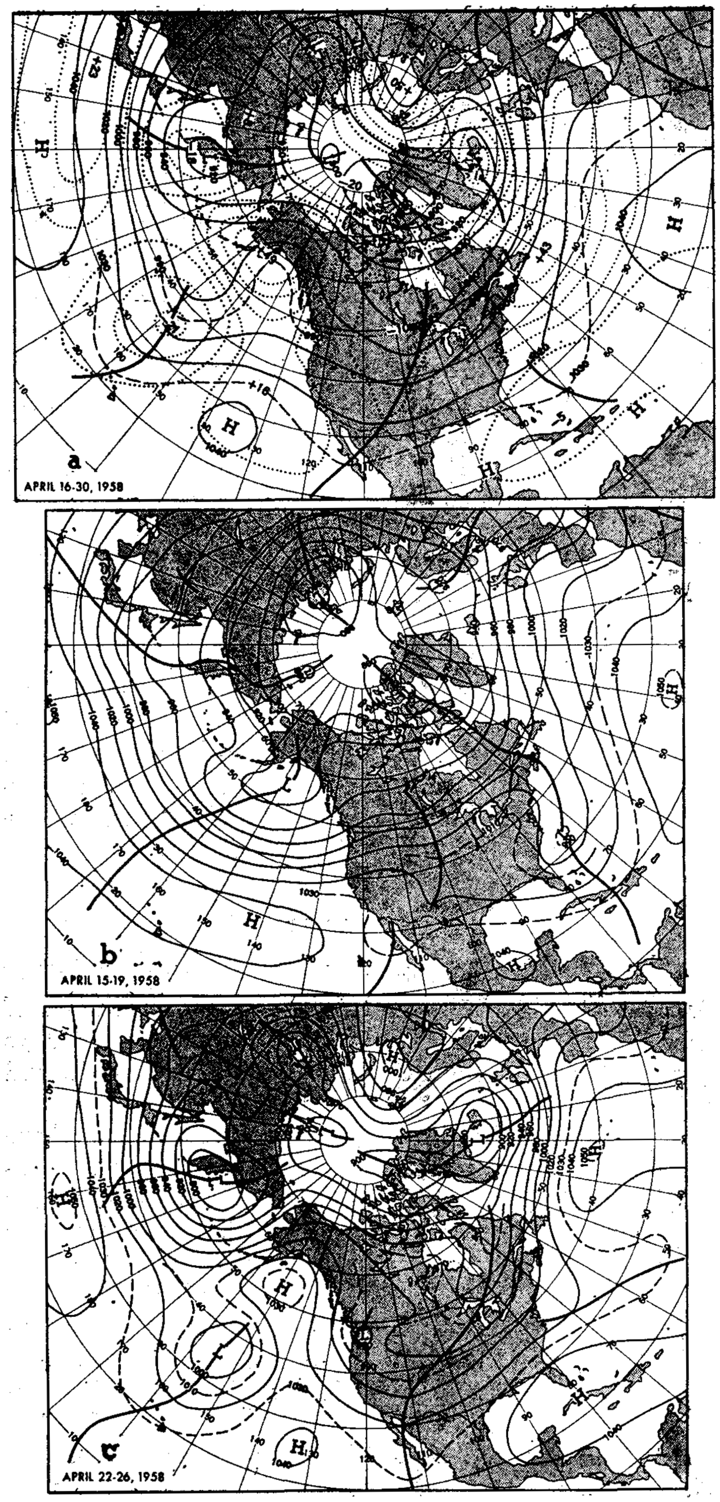


FIGURE 7.—(a) 15-day mean 700-mb. contours (solid) and height departures from normal (dotted) (both in tens of feet) for April 16–30, 1958. Well-defined United States trough replaced shattered troughs and blocking ridge of first half of month. Note the more meridional pattern of height departures from normal. (b) 5-day mean 700-mb. contours (tens of feet) for April 15–19, 1958, representative of week ending April 20. Compared with the previous week (fig. 5c), the westerlies strengthened considerably in higher latitudes over North America and weakened in lower latitudes. (c) 5-day mean 700-mb. contours (tens of feet), for April 22–26, 1958, representative of week ending April 27. This is an example of the extreme variability within the month, with change from a zonal to a meridional pattern in one week.

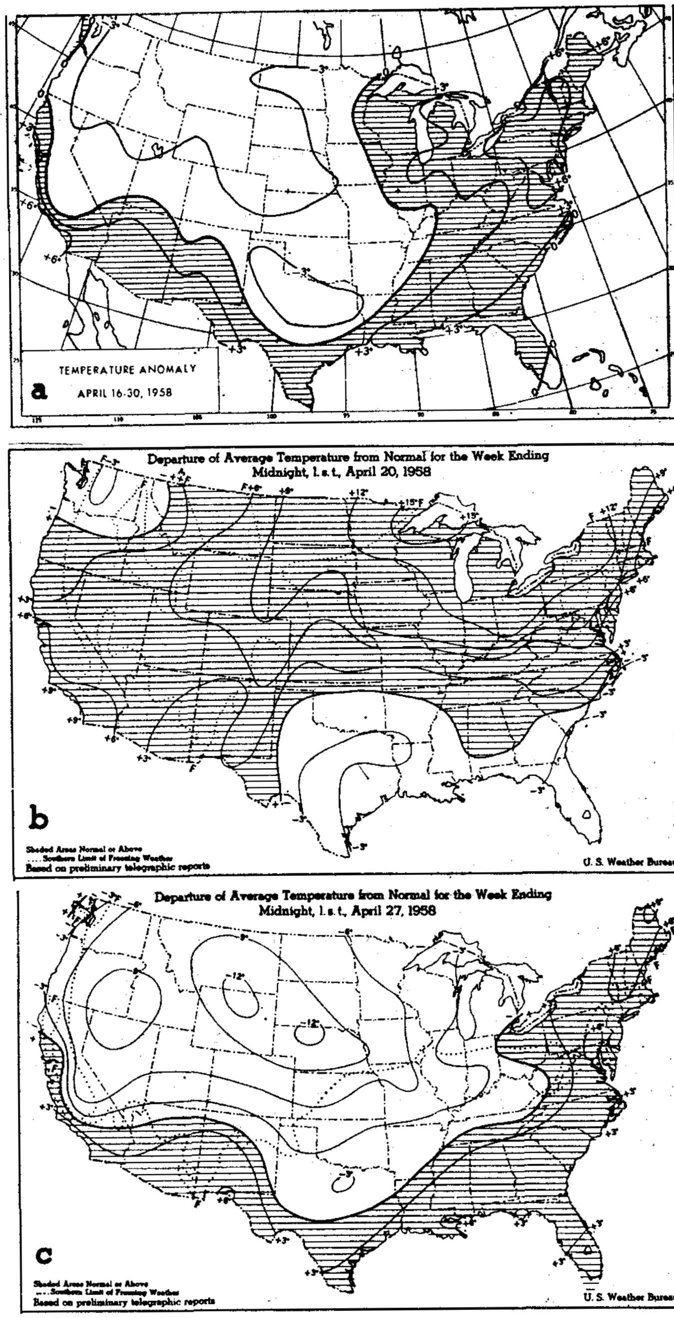


FIGURE 8.—Departure of average surface temperatures from normal (F. °) during the last half of April 1958. (a) April 16–30. This meridional distribution of temperature anomalies is in marked contrast to that of the previous 15-day period. (b) Week ending April 20. Normal or above normal temperatures over most of the country were a response to the northerly migration of westerlies during this week. (c) Week ending April 27. Here again is another reversal. During this week cold continental polar and maritime Pacific airmasses dominated the country as a result of the large amplification in the eastern Pacific Ocean.

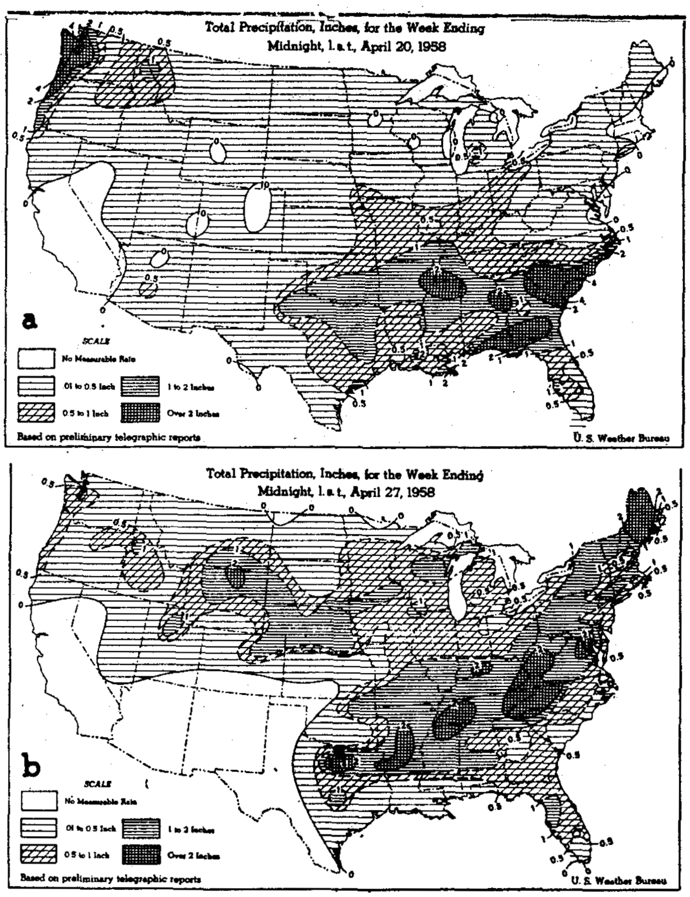


FIGURE 9.—Total precipitation, in inches, for: (a) April 15–21, 1958. Most of the precipitation was accounted for by one storm in the Gulf of Mexico early in the week and several frontal passages into the Pacific Northwest. (b) April 22–28, 1958. The pattern of areas of precipitation exceeding 1 inch has a fair correspondence with the areas of maximum cyclonic curvature on the 5-day mean chart for the same week (fig. 7c).

were basically responsible for the fairly strong advection of cold air into the northwestern third of the country. There must have been some dynamic cooling as the trough deepened, but this was probably of less significance than the advective cooling. Decreases in anomalous temperatures in the Northwest ranged as high as 16.3 F.° at Winnipeg, with changes in the 5°–10° category commonplace. The eastern third of the United States was dominated by widespread warming which was caused by the southerly DN flow and the advection of maritime tropical air in advance of the mean trough.

Further details of the circulation of April 16–30 can be seen by an examination of the weekly variability in that period. Figure 7b shows the 5-day mean 700-mb. circulation centered in the middle of the week ending April 21. In this instance the westerlies were quite strong north of 40° N., but rather flat and ill-defined in lower latitudes of the United States. The temperature pattern (fig. 8b) showed a remarkable reversal. About three-fourths of the country was flooded by normal and above normal temperatures with readings as high as 91° F. in South Dakota, while cooler air began to invade Washington. Residual cold air along the Gulf of Mexico kept temperatures there below normal, although less so than in the previous week.

Along with the general warming came a large area of light precipitation (fig. 9a). Heavy amounts were confined to the Pacific Northwest coast, following several frontal passages, and to the Southeast as a result of one Gulf storm early in the week.

Figure 7c is representative of the circulation for the last week of April. The change from the previous week's circulation was quite extreme. From the eastern Pacific to the central United States a strong meridional flow was observed, in contrast to the strong zonal flow of the previous week, as amplification in the eastern Pacific and western North America reached its maximum.

Explosive deepening in the Great Basin on the 22d and 23d was associated barotropically with the propagation of vorticity from the eastern Pacific and baroclinically with the strong thermal advection (for more details see [7]). It was followed by the coldest intrusion of Canadian air of the month. Some temperatures in the West fell as much as 12 F.° below normal (fig. 8c), where they had been as much as 9 F.° above normal the week before (fig. 8b). An example of the temperature gradient accompanying that storm, as reported by the *Weekly Weather and Crop Bulletin* [6], was the record high temperatures of 91° F. in eastern Kansas on the 23d, and a record minimum of 21° F. in northwestern Kansas on the 24th. Not as extreme, but indicative of the weekly variability, was the low of 31° F. at Roswell, N. Mex., on April 14 followed by a maximum of 91° F. on April 22 at the same city.

Cold air surging eastward as far as West Virginia toppled various minimum temperature records, while normal and above average temperatures were recorded in the East Coast States and in portions of the South and Southwest.

The week's precipitation is shown in figure 9b. Heavier accumulations were confined to the northern Rocky Mountain States and in a corridor extending from northern Texas to New England, while the Southwest was mostly dry. Rising flood stages were noted in parts of New England and the South, but serious flooding was not of major proportions this week.

The variability of temperature (and to some extent of precipitation) during the month was intimately related to the variability of the 700-mb. mean flow. The relationship of another group of phenomena, severe storms, will be considered next.

TORNADO ACTIVITY

The incidence of tornadoes in April 1958 (table 3) was significantly lower than that reported in April 1957. Since acceptable normals are not available, one cannot classify this month's tornado totals relative to normal. However, it may be of interest to briefly compare this year's April circulation (fig. 1) with that of April 1957 (fig. 8 of [8]). The positions of the central United States troughs were comparable, but the similarity ends there.

TABLE 3.—*Number of tornadoes and funnel clouds reported in the United States, January–April 1957 and 1958.**

Month	1957			1958		
	Tornadoes	Funnels	Total	Tornadoes	Funnels	Total
January	18	1	19	14	4	18
February	5	0	5	22	5	27
March	39	26	65	17	10	27
April	217	164	381	**85	**93	**178
Total	279	191	470	138	112	250

*Data tabulated by the U. S. Weather Bureau, Office of Climatology, Washington D.C.
**Preliminary totals.

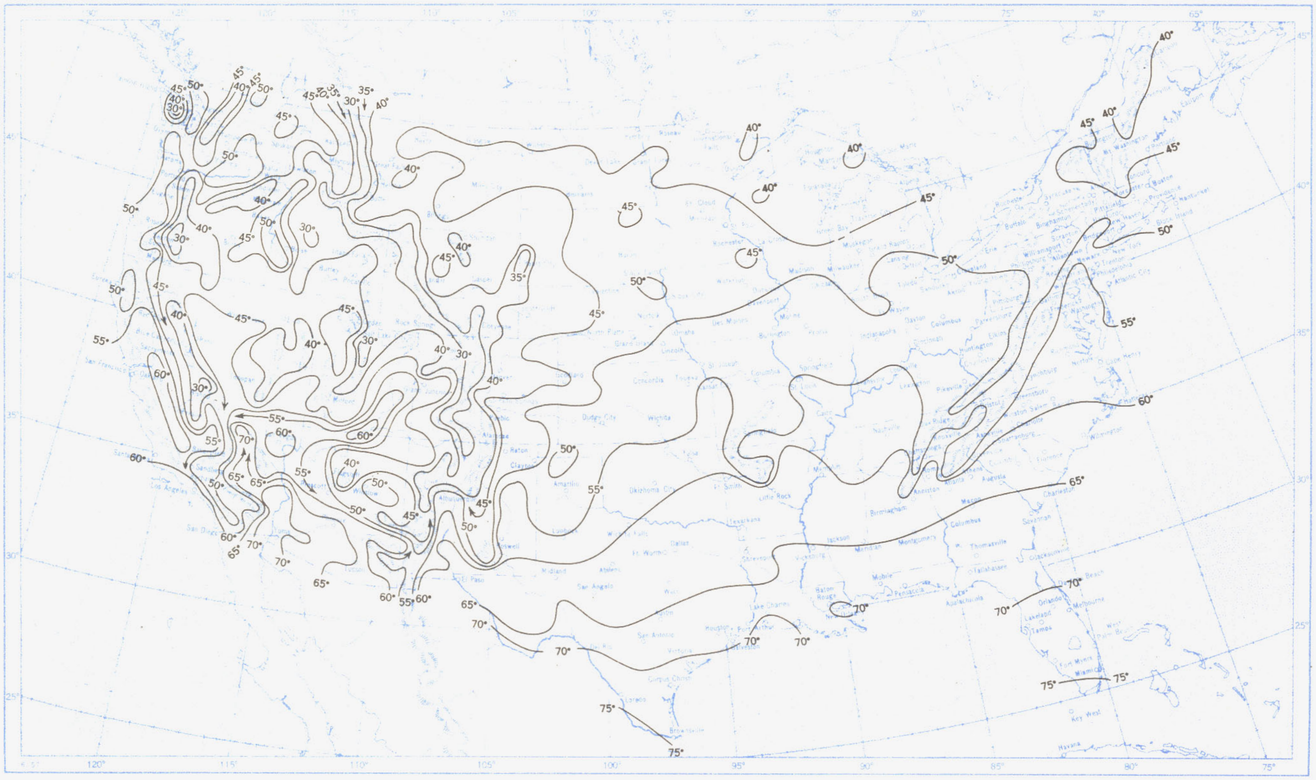
In April 1957 a ridge some 200 feet above normal lay along the east coast. That ridge was accompanied by a strong southerly positive DN flow over the Midwest, a condition conducive to a mean influx of warm, moist, tropical air. The same area in April 1958 was dominated by below normal heights and did not have a southerly DN flow suggestive of extended intrusions of maritime tropical air into the Midwest.

It seems fairly clear that this year's decrease in tornado activity was effected by the persistent block in eastern Canada, a real deterrent to middle- and low-latitude ridging in the eastern United States.

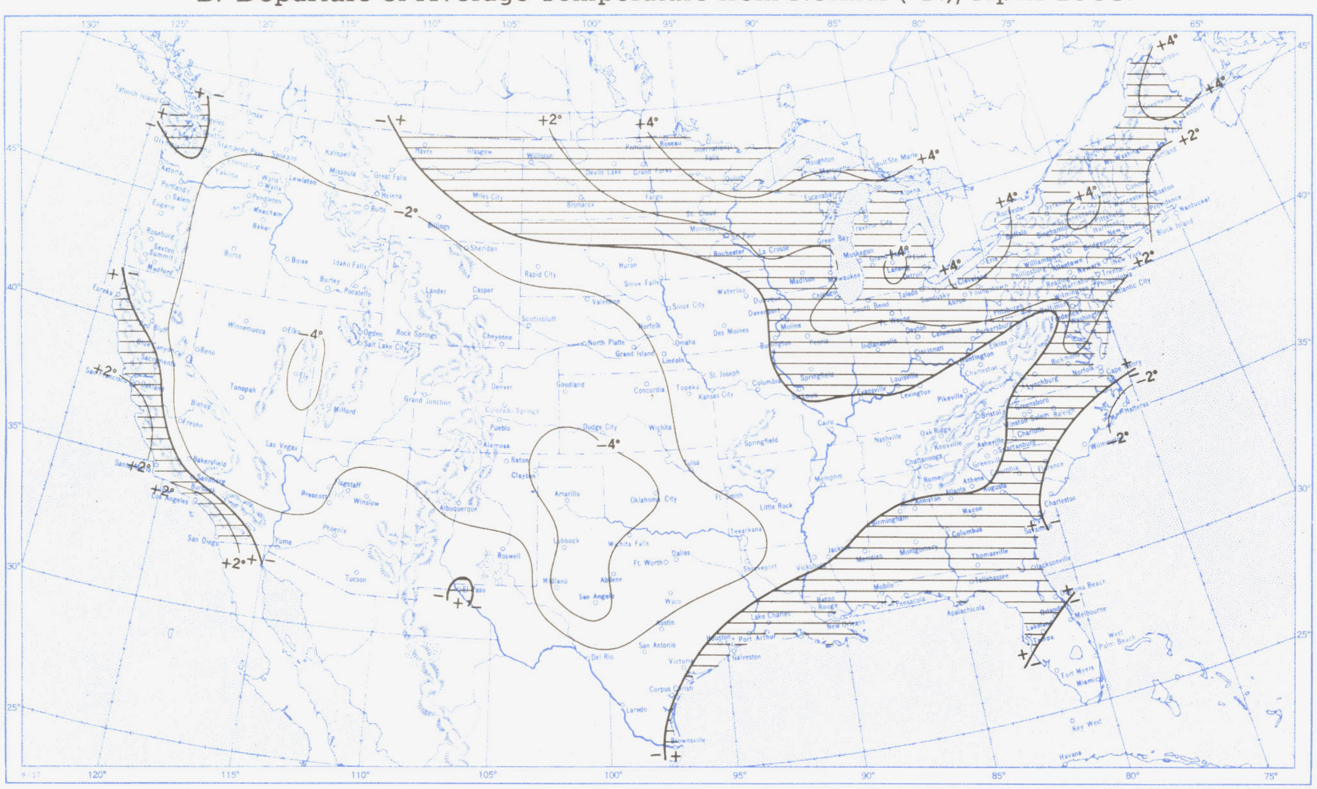
REFERENCES

1. R. A. Green, "The Weather and Circulation of March 1958," *Monthly Weather Review*, vol. 86, No. 3, Mar. 1958, pp. 100–107.
2. J. F. O'Connor, "The Weather and Circulation of January 1958—Low Index with Record Cold in Southeastern United States," *Monthly Weather Review*, vol. 86, No. 1, Jan. 1958, pp. 11–18.
3. W. H. Klein, "The Weather and Circulation of February 1958—A Month With an Expanded Circumpolar Vortex of Record Intensity," *Monthly Weather Review*, vol. 86, No. 2, Feb. 1958, pp. 60–70.
4. U. S. Weather Bureau, "Normal Weather Charts for the Northern Hemisphere," *Technical Paper* No. 21, 1952, 74 pp.
5. W. H. Klein, "Principal Tracks and Mean Frequencies of Cyclones and Anticyclones in the Northern Hemisphere," U. S. Weather Bureau *Research Paper* No. 40, 1957, 60 pp.
6. U. S. Weather Bureau, *Weekly Weather and Crop Bulletin, National Summary*, vol. XLV, Nos. 14 and 17, Apr. 7 and 28, 1958.
7. R. F. Shaw and E. J. Joseph, "Rapid Cyclogenesis over the Great Basin, April 22–23, 1958," *Monthly Weather Review*, vol. 86, No. 4, Apr. 1958, pp. 141–146.
8. J. F. Andrews, "The Weather and Circulation of April 1957—A Stormy Month over the United States Characterized by Two Contrasting Temperature Regimes," *Monthly Weather Review*, vol. 85, No. 4, Apr. 1957, pp. 124–131.

Chart I. A. Average Temperature (°F.) at Surface, April 1958.



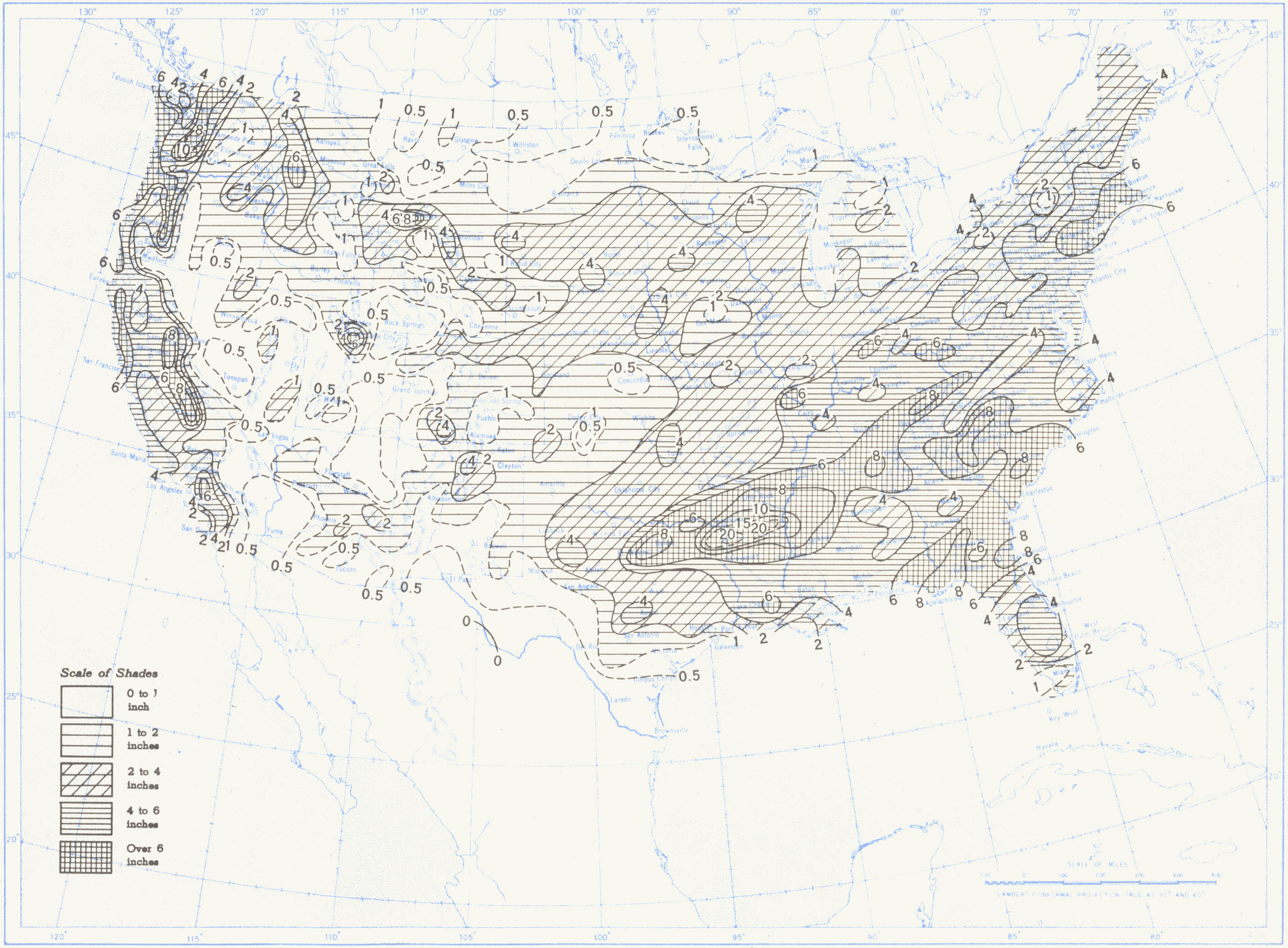
B. Departure of Average Temperature from Normal (°F.), April 1958.



A. Based on reports from over 900 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.

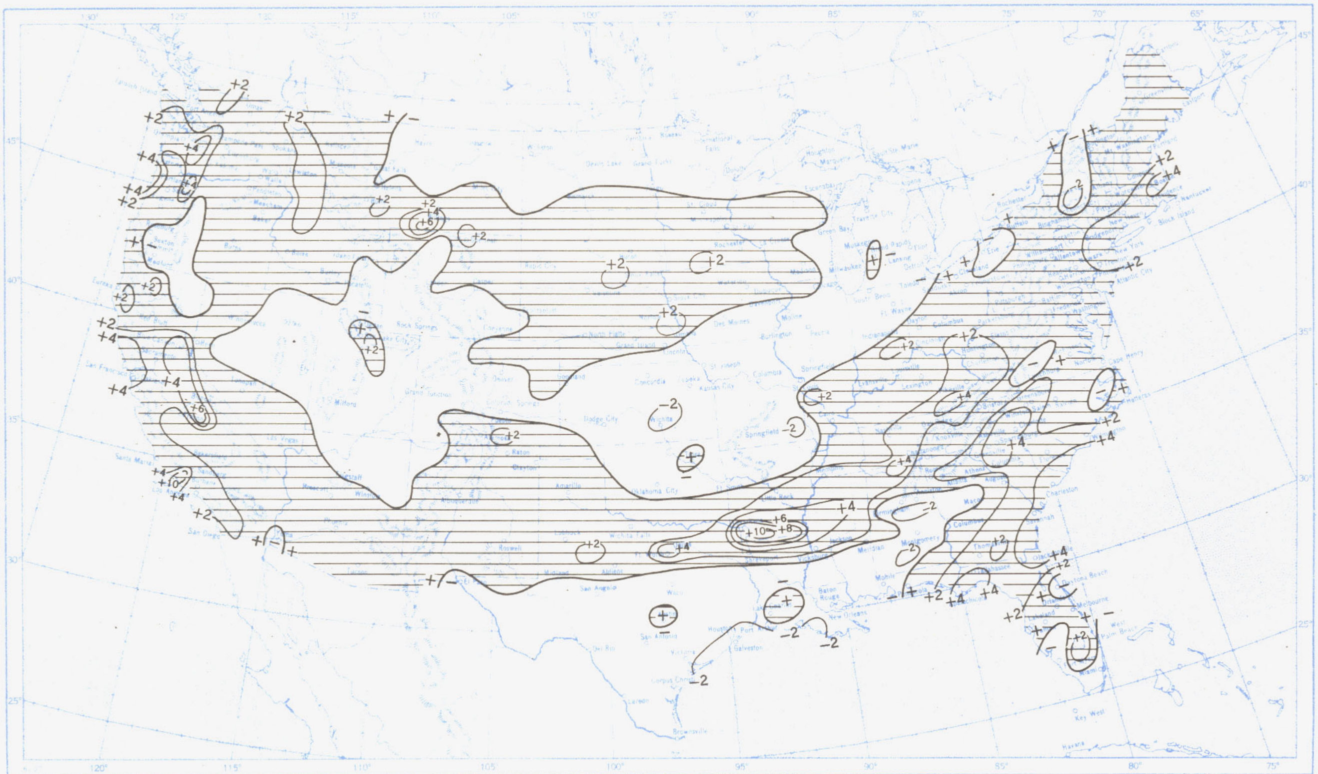
B. Departures from normal are based on the 30-yr. normals (1921-50) for Weather Bureau stations and on means of 25 years or more (mostly 1931-55) for cooperative stations.

Chart II. Total Precipitation (Inches), April 1958.

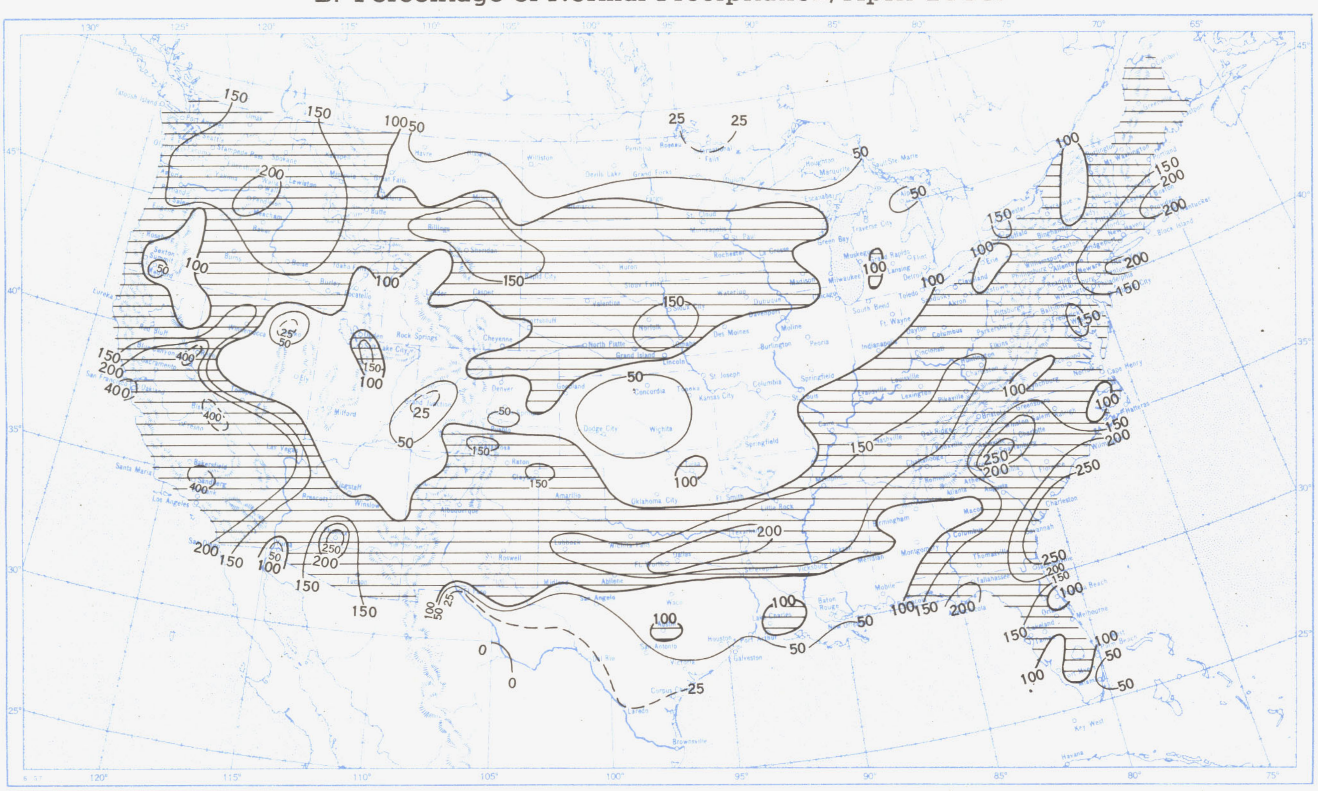


Based on daily precipitation records at about 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), April 1958.

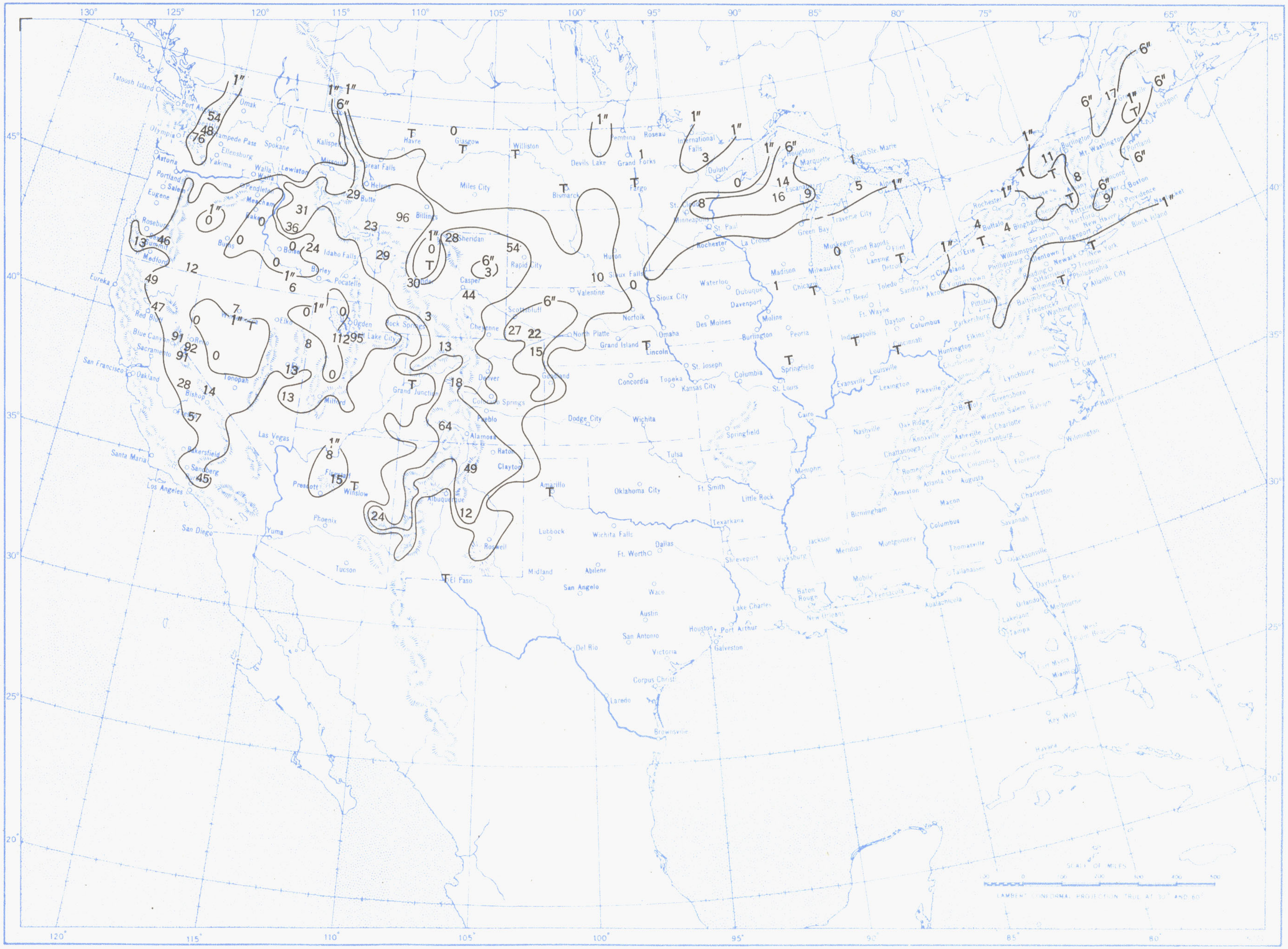


B. Percentage of Normal Precipitation, April 1958.



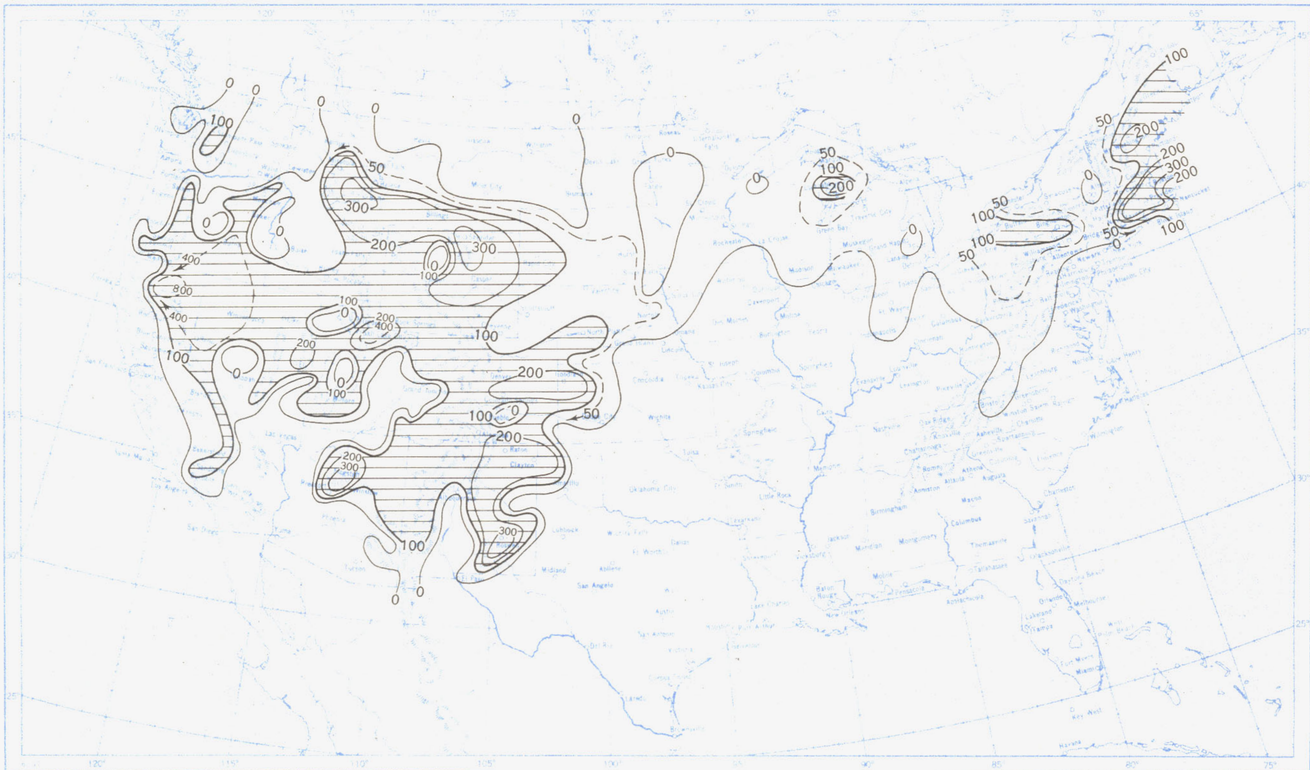
Normal monthly precipitation amounts are computed from the records for 1921-50 for Weather Bureau stations and from records of 25 years or more (mostly 1931-55) for cooperative stations.

Chart IV. Total Snowfall (Inches), April 1958.



This is the total of unmelted snowfall recorded during the month at Weather Bureau and cooperative stations. This chart and Chart V are published only for the months of November through April although of course there is some snow at higher elevations, particularly in the far West, earlier and later in the year.

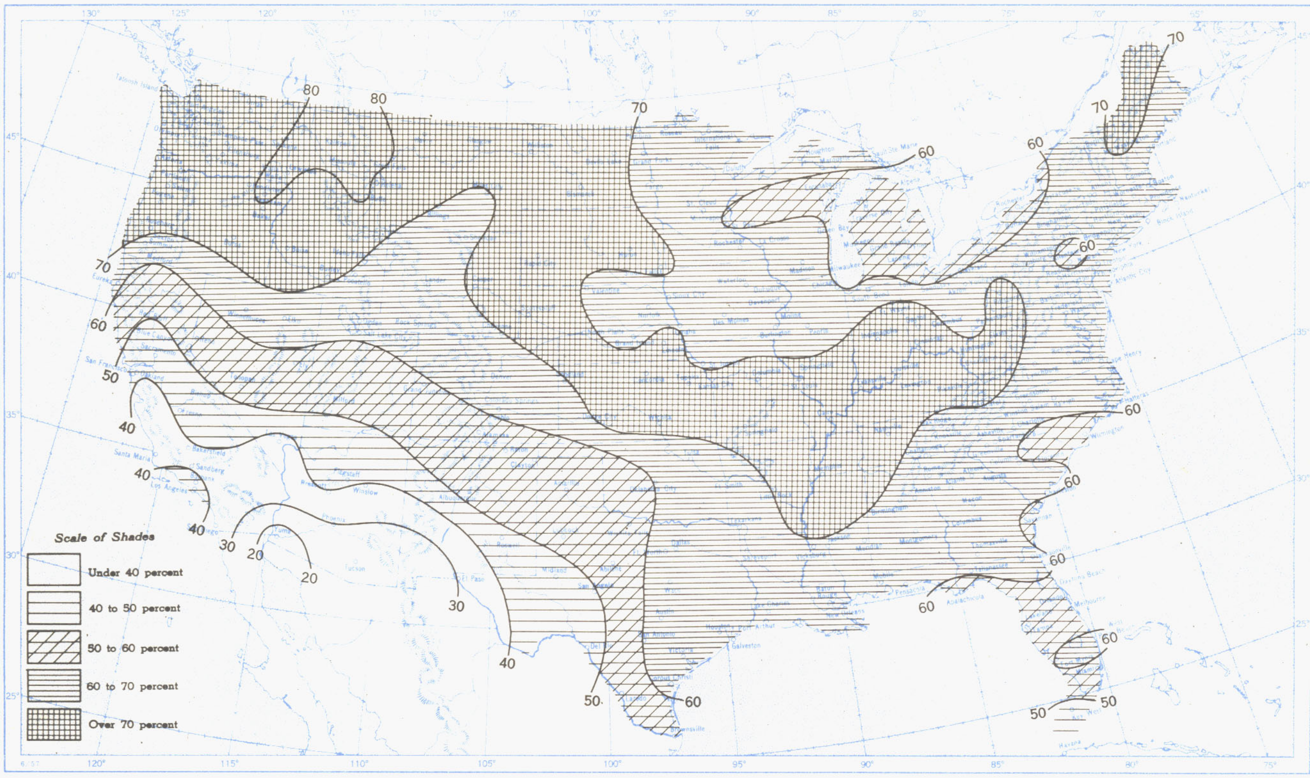
Chart V. A. Percentage of Normal Snowfall, April 1958.



B. Depth of Snow on Ground (Inches)

A. Amount of normal monthly snowfall is computed for Weather Bureau stations having at least 10 years of record. B. Shows depth currently on ground at 7:00 a.m. E.S.T., of the Monday nearest the end of the month. It is based on reports from Weather Bureau and cooperative stations. Dashed line shows greatest southern extent of snowcover during month.

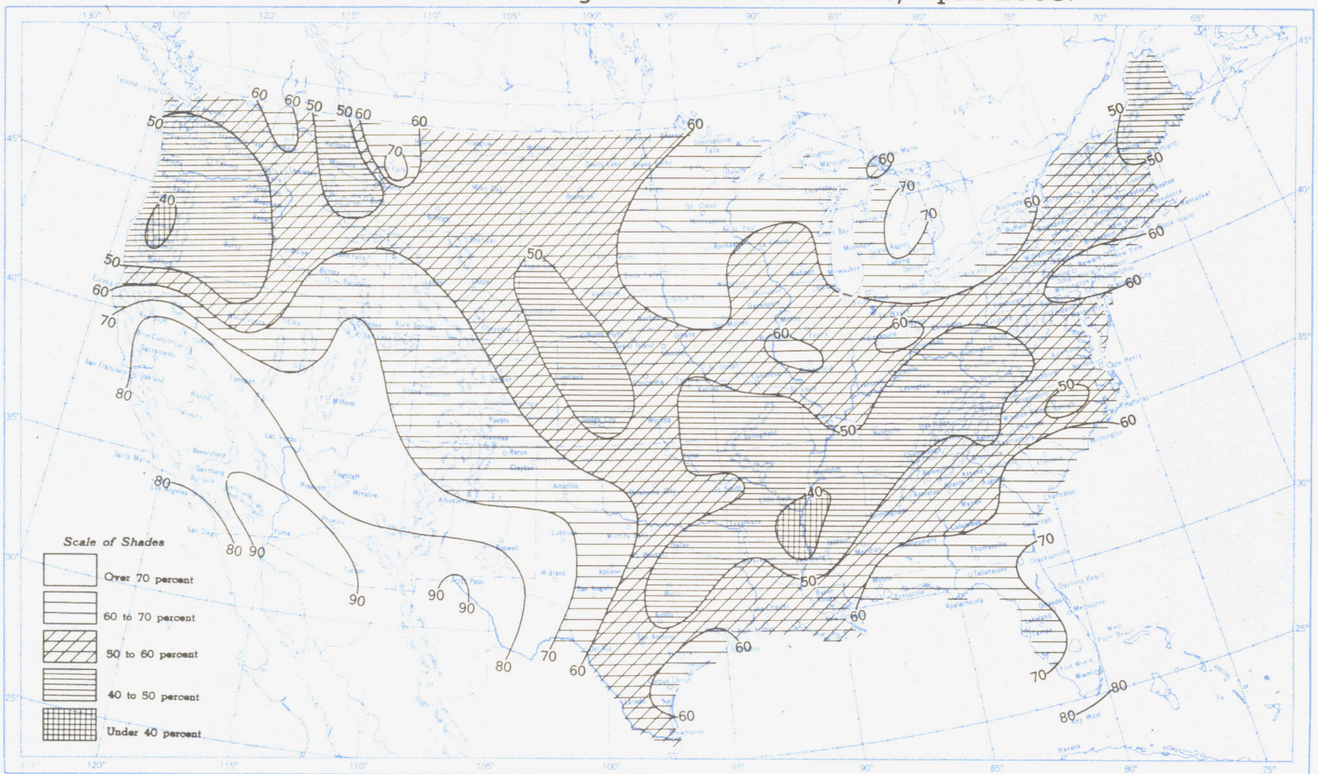
Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, April 1958.



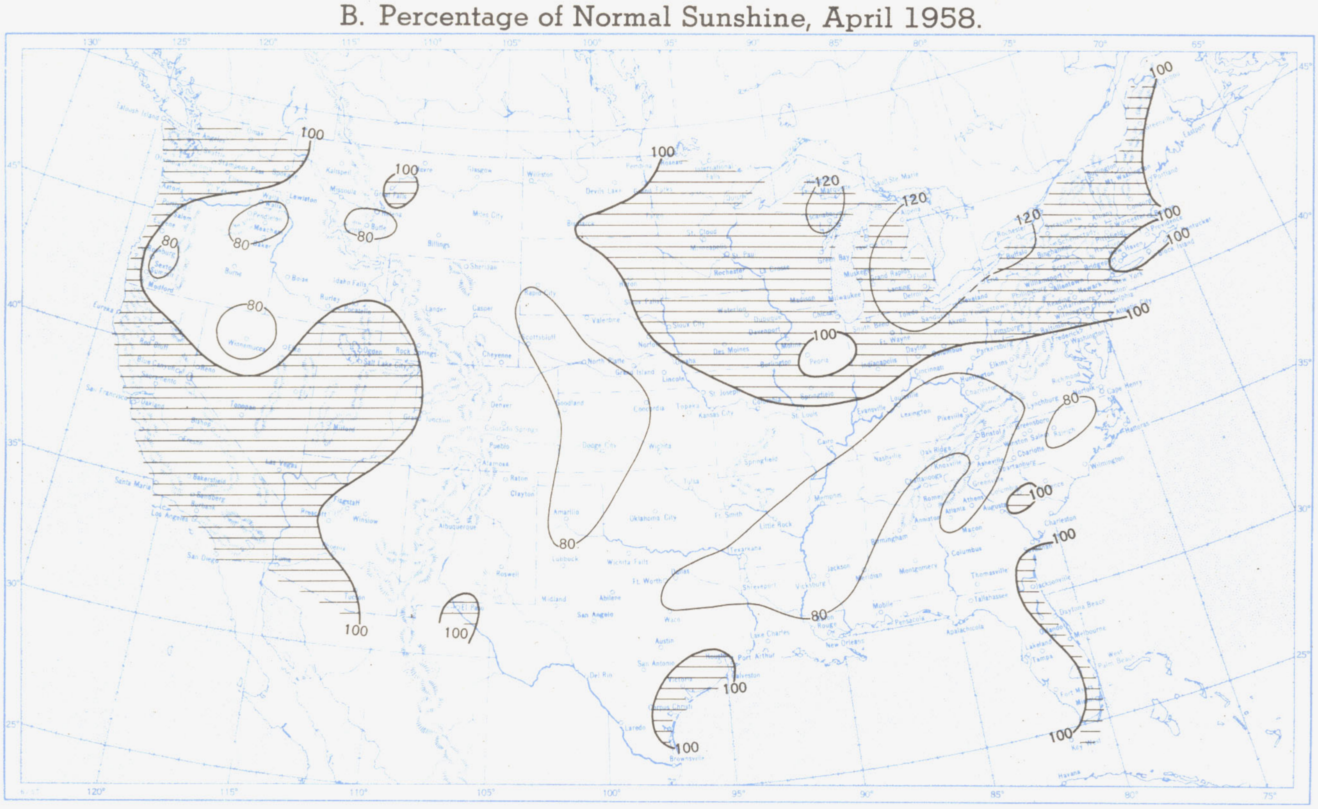
B. Percentage of Normal Sky Cover Between Sunrise and Sunset, April 1958.

A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, April 1958.



B. Percentage of Normal Sunshine, April 1958.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, April 1958. Inset: Percentage of Mean Daily Solar Radiation, April 1958. (Mean based on period 1951-55.)

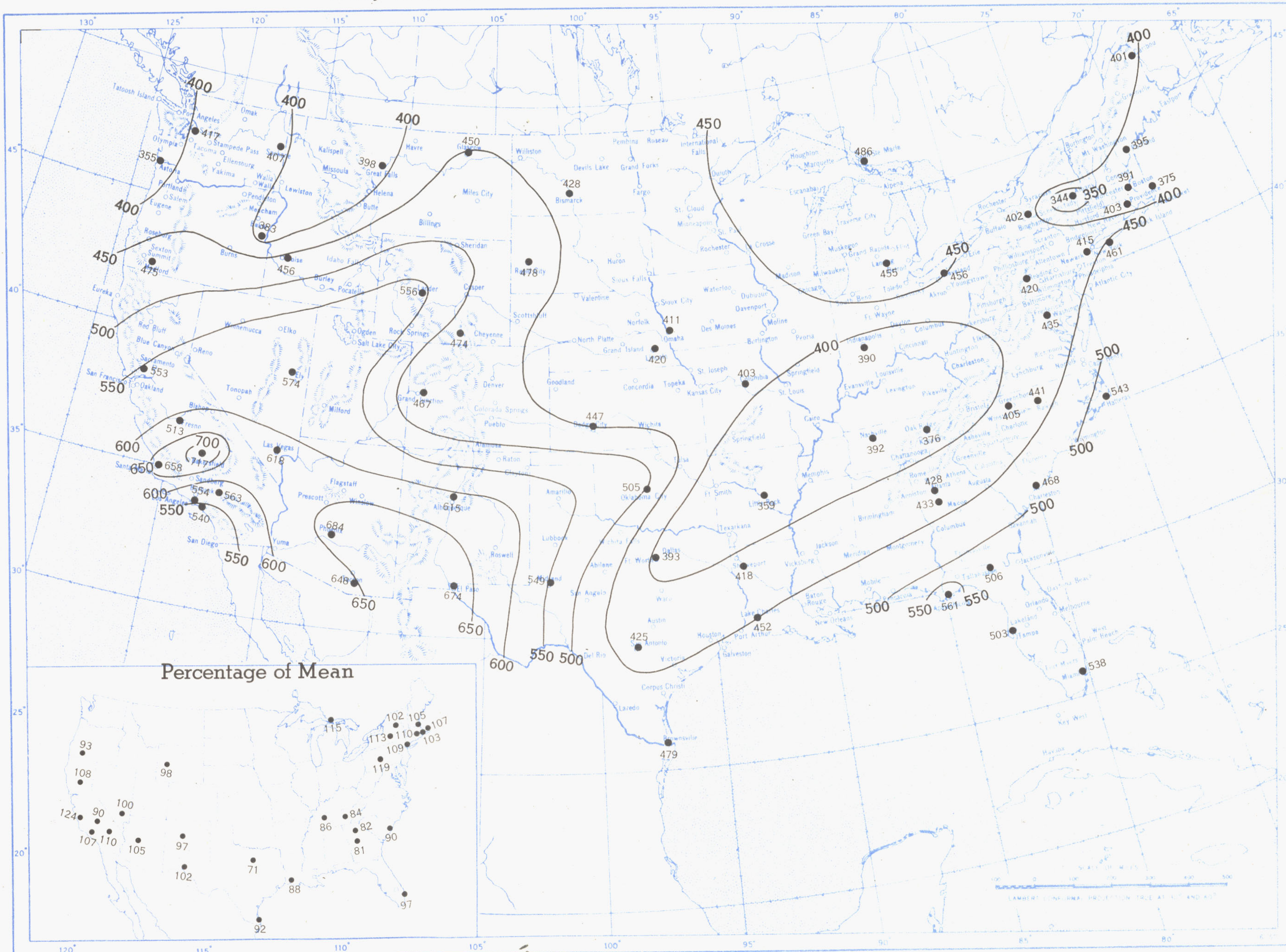
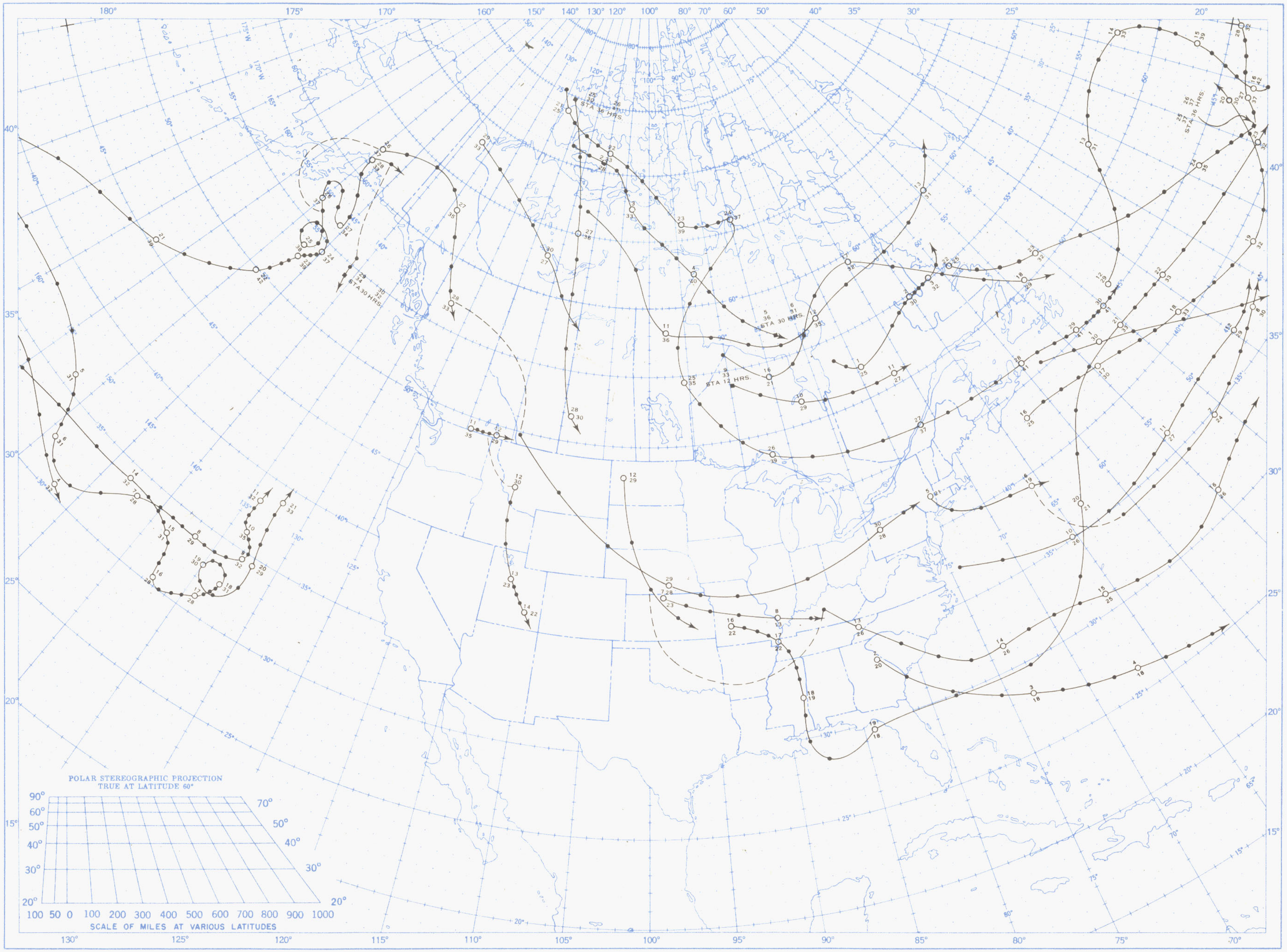


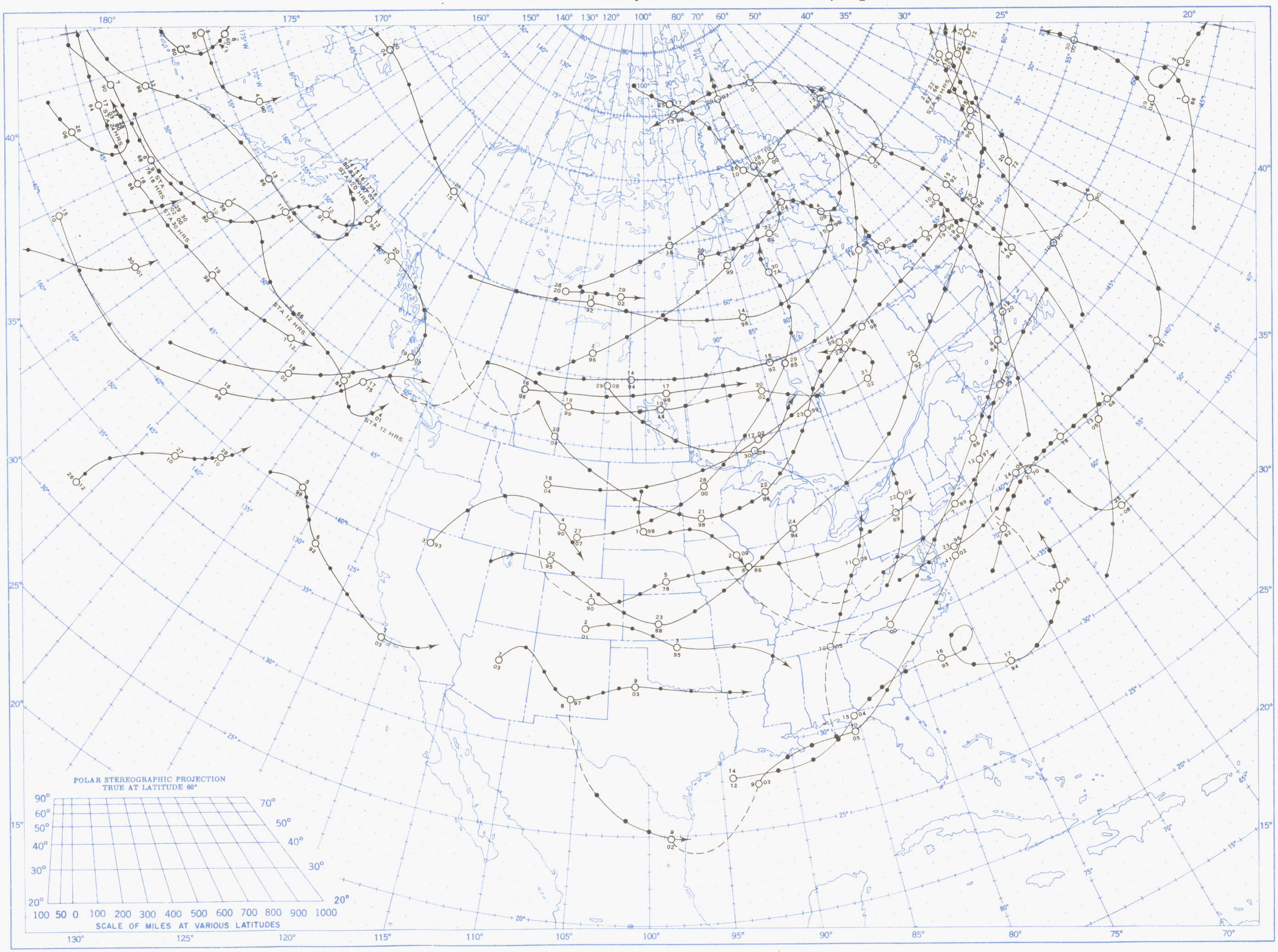
Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langleys (1 langley = 1 gm. cal. cm. $^{-2}$). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown. The inset shows the percentage of the mean based on the period 1951-55.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, April 1958.



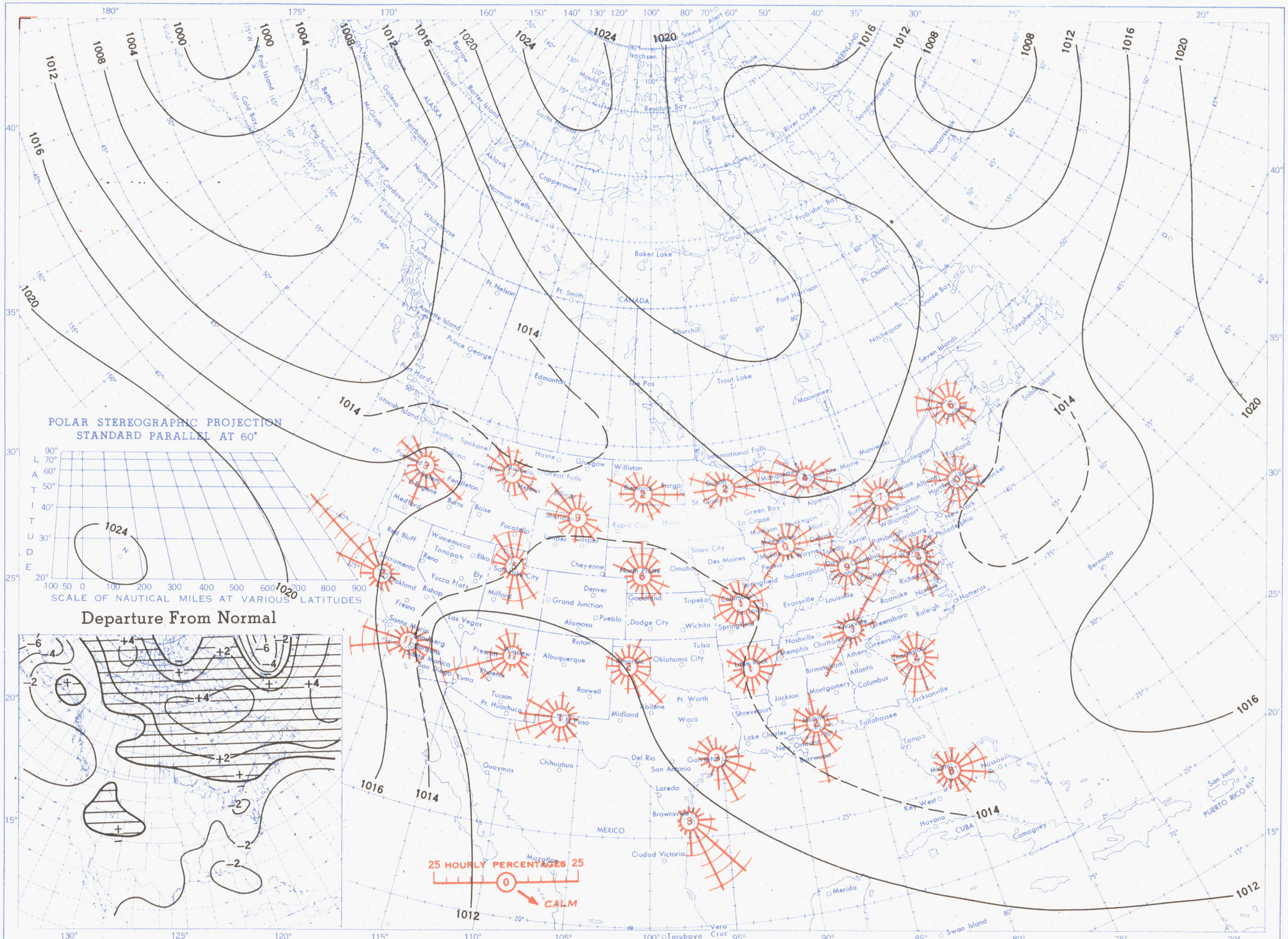
Circle indicates position of center at 7:00 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

Chart X. Tracks of Centers of Cyclones at Sea Level, April 1958.



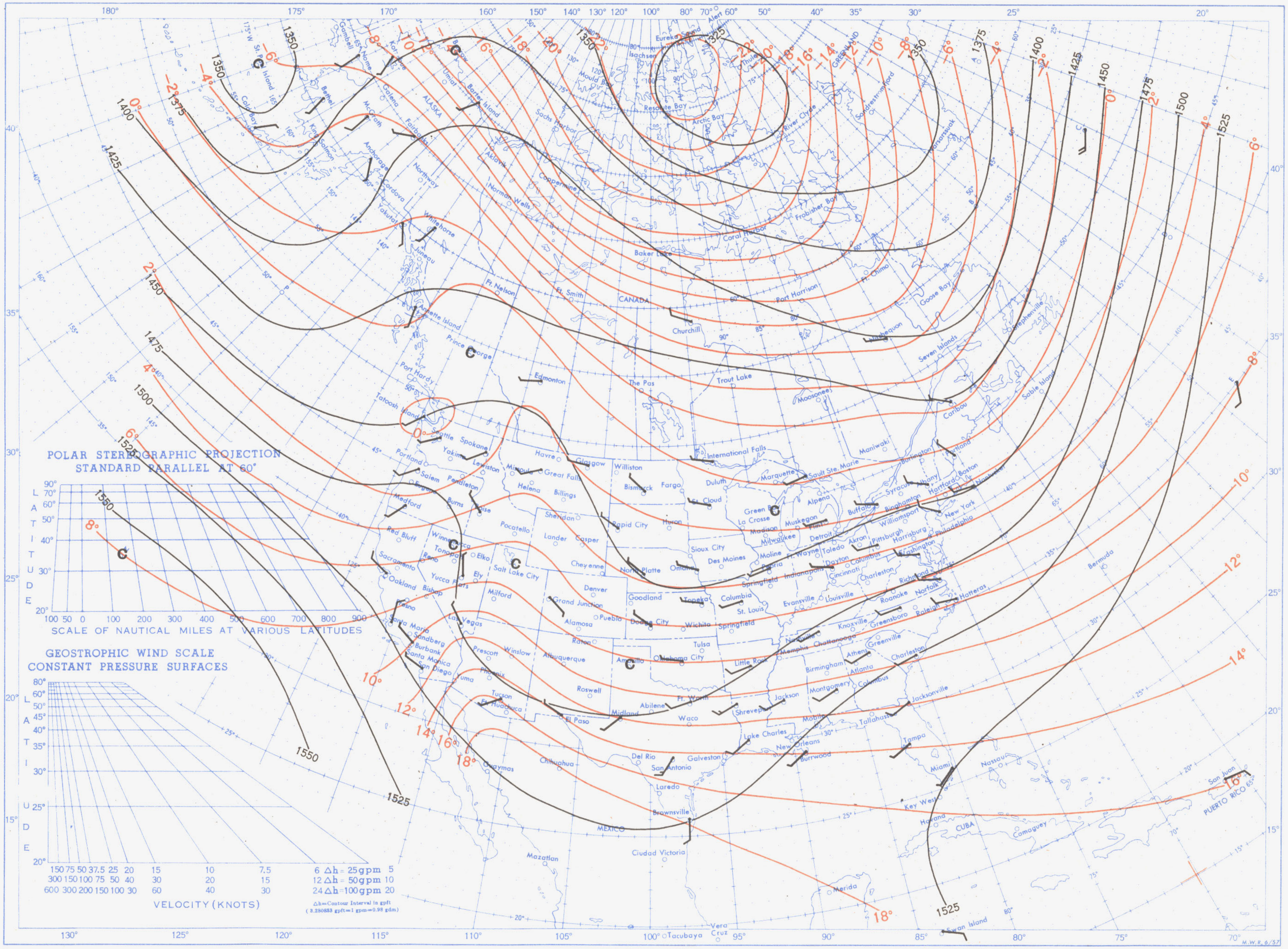
Circle indicates position of center at 7:00 a.m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, April 1958. Inset: Departure of Average Pressure (mb.) from Normal, April 1958.



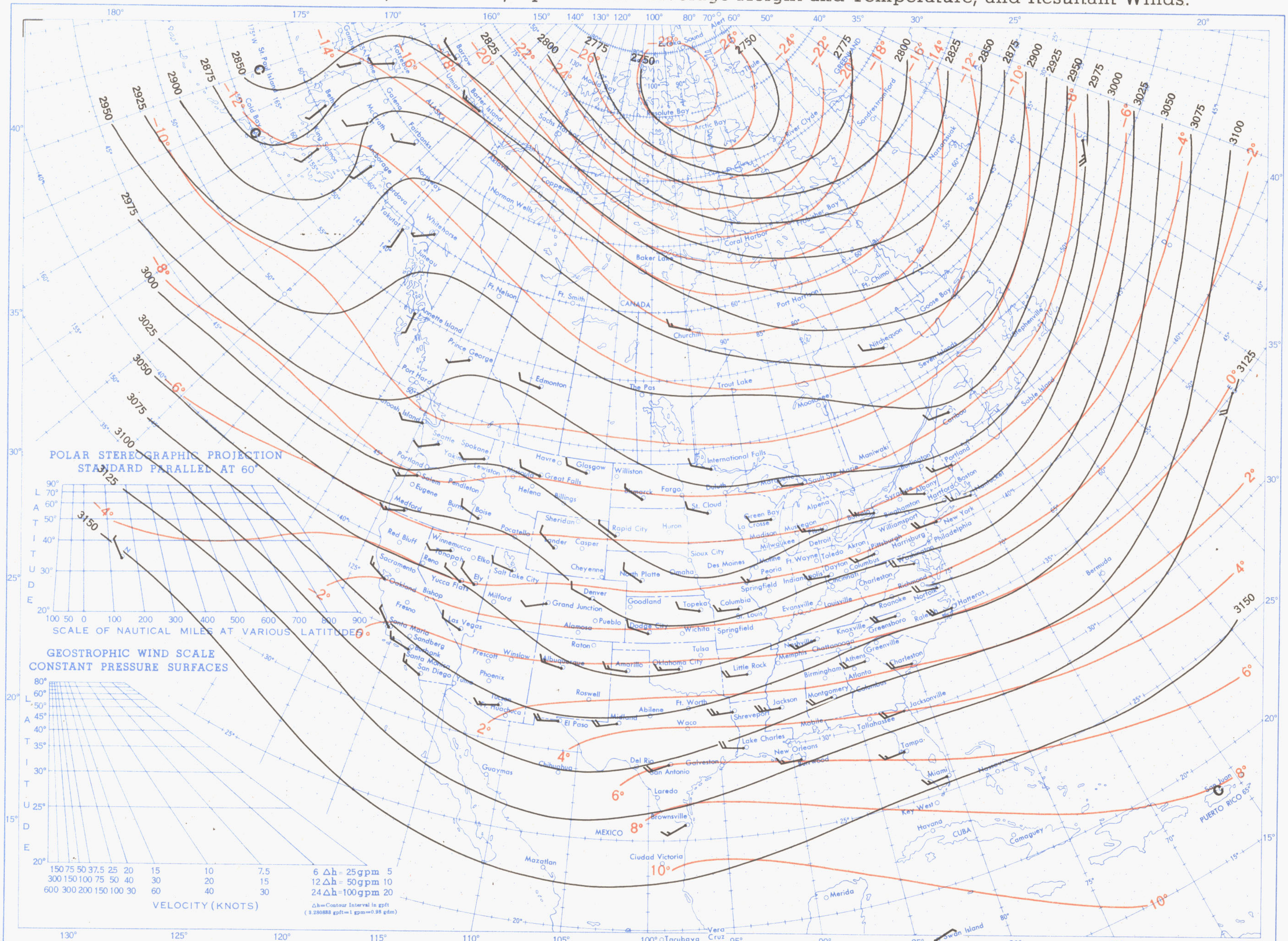
Average sea level pressures are obtained from the averages of the 7:00 a.m. and 7:00 p.m. E.S.T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° intersections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. 850-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



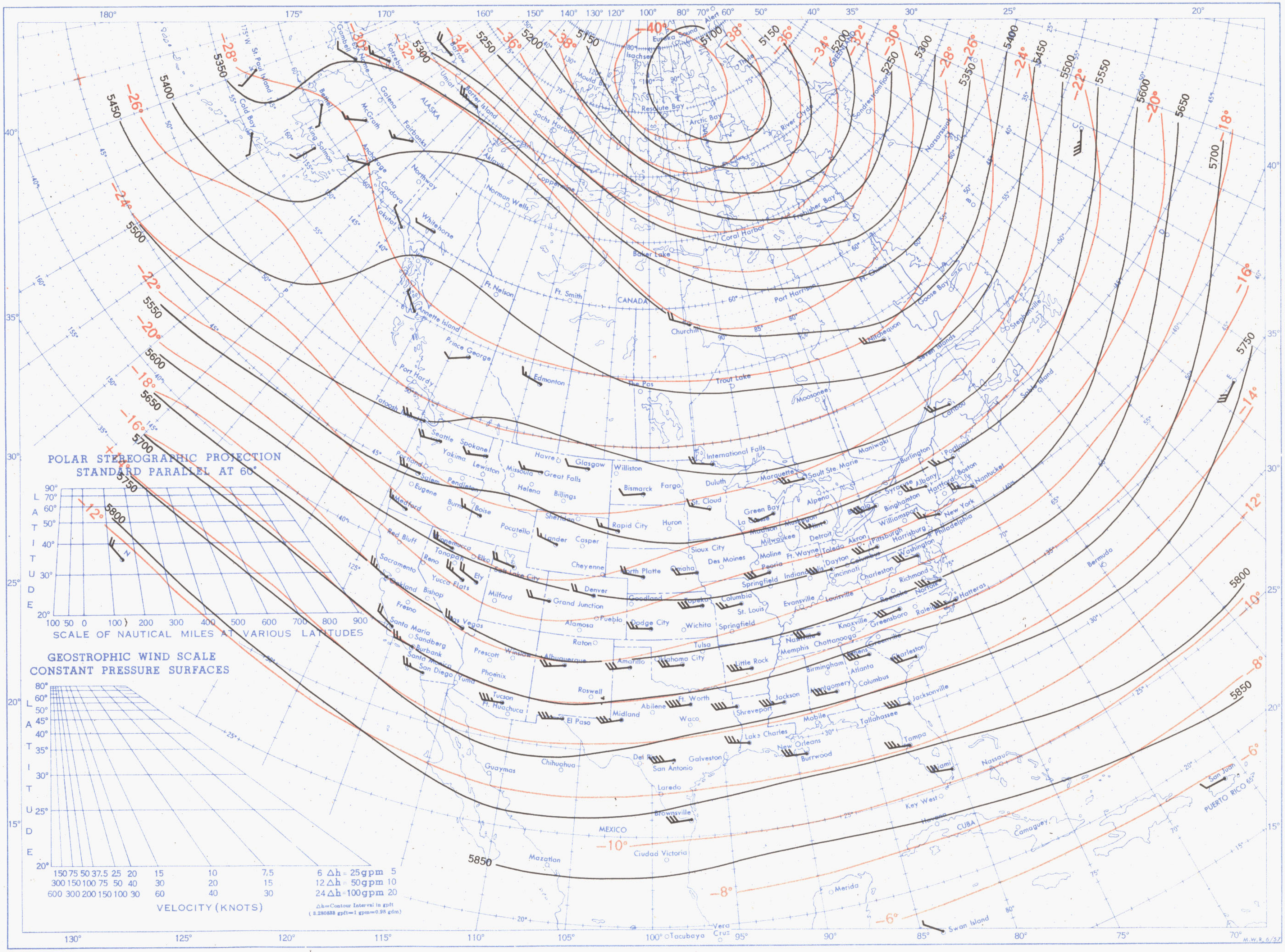
Height in geopotential meters (1 g.p.m. = 0.98 dynamic meters). Temperature in °C. Wind speed in knots; flag represents 50 knots, full feather 10 knots, and half feather 5 knots. All wind data are based on rawin observations.

Chart XIII. 700-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



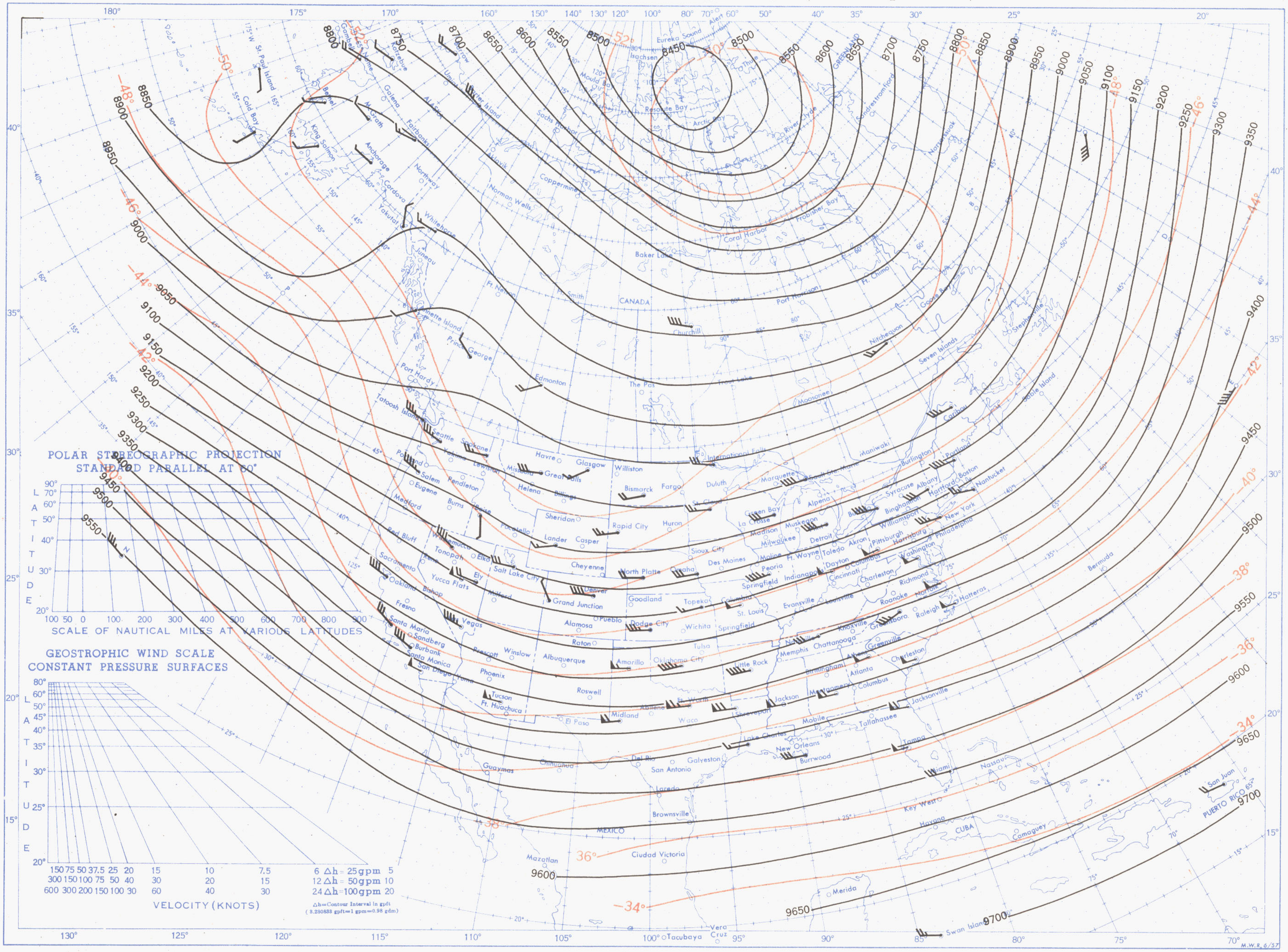
See Chart XII for explanation of map.

Chart XIV. 500-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



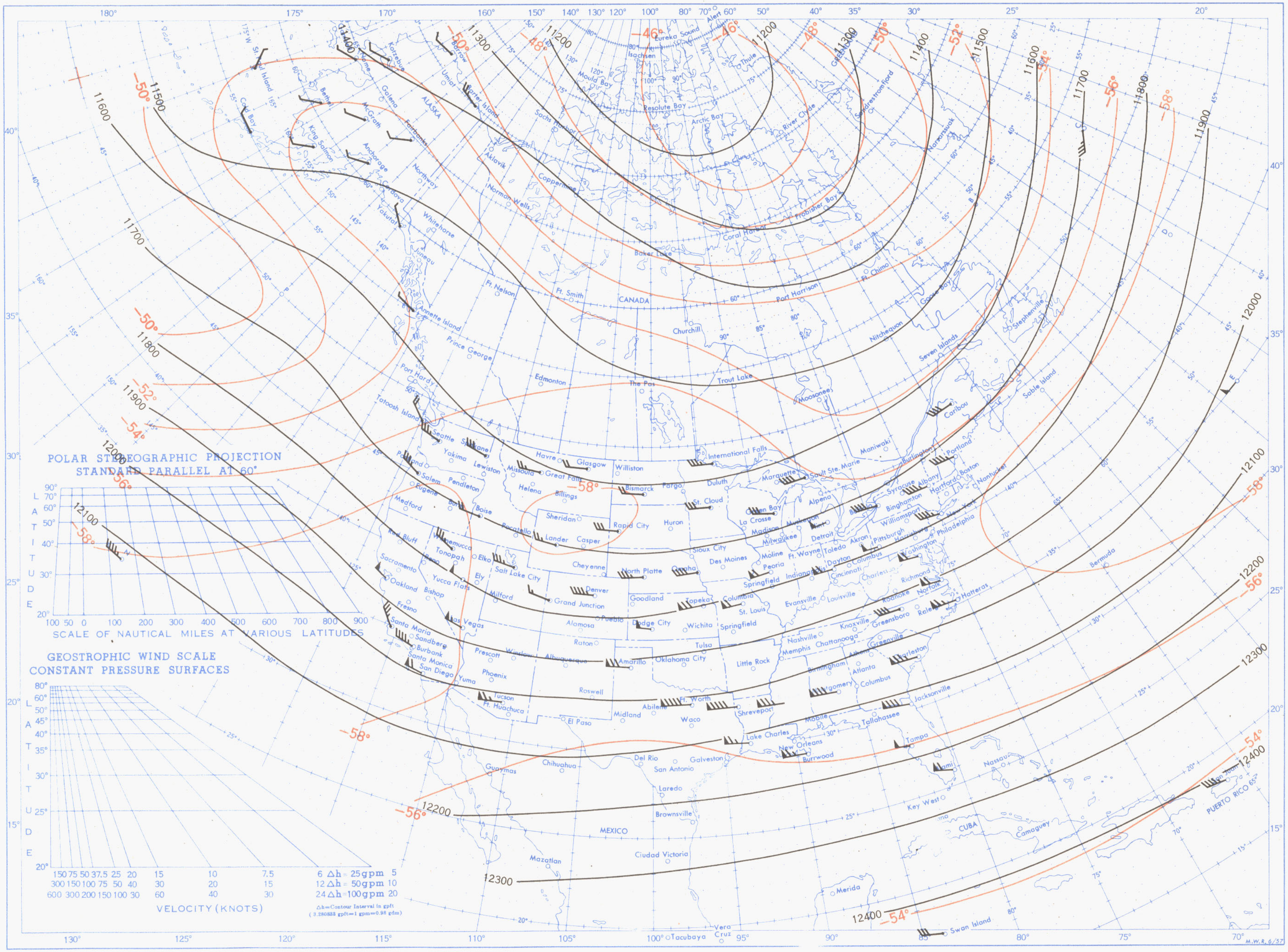
See Chart XII for explanation of map.

Chart XV. 300-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



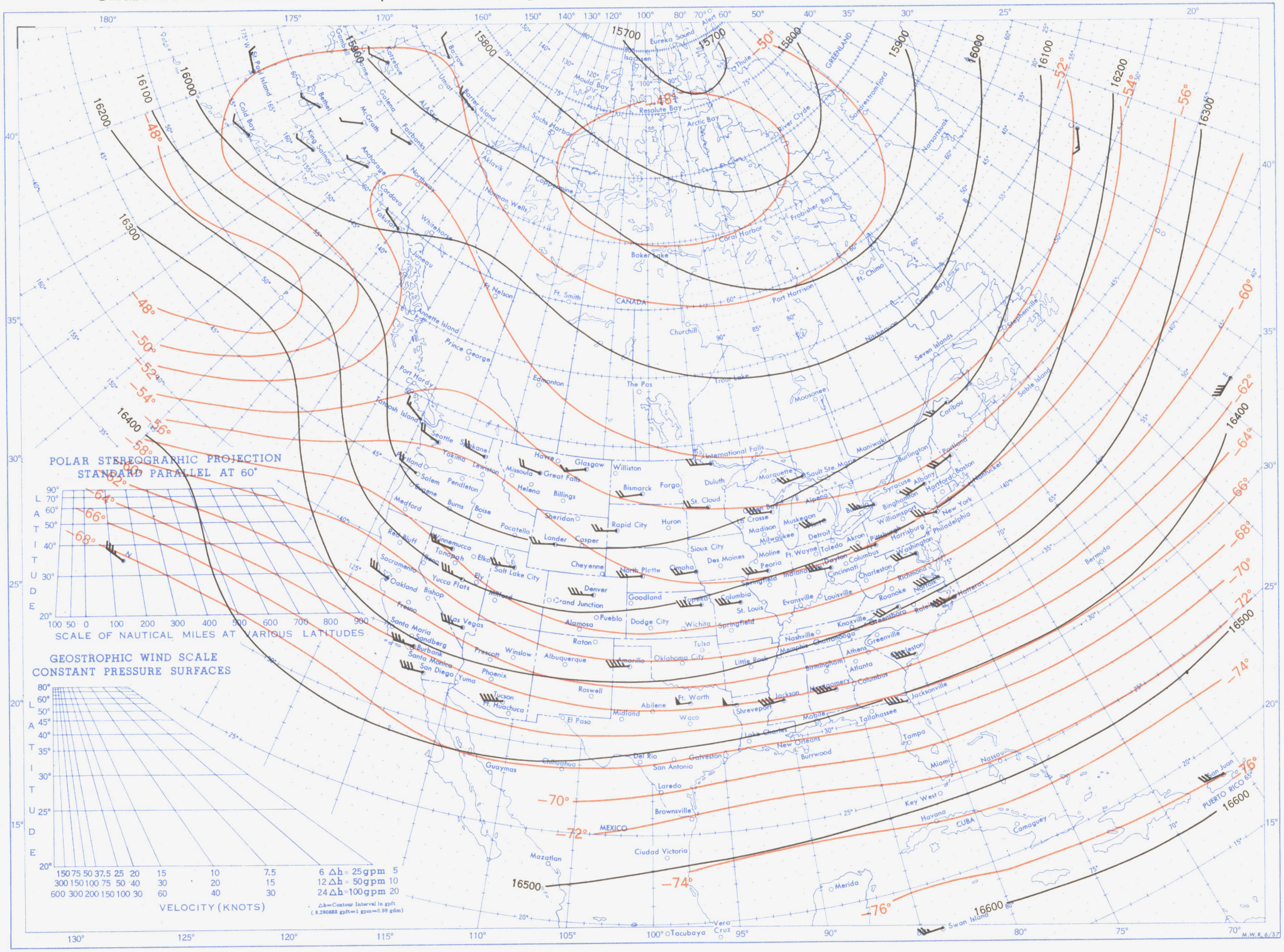
See Chart XII for explanation of map.

Chart XVI. 200-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



See Chart XII for explanation of map.

Chart XVII. 100-mb. Surface, 1200 GMT, April 1958. Average Height and Temperature, and Resultant Winds.



See Chart XII for explanation of map.